



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)



**Approved by AICTE, Recognized by UGC & Affiliated to Anna University
Accredited by NBA-AICTE, NAAC-UGC with 'A++' Grade**

Saravanampatti, Coimbatore -641035

**CURRICULA AND SYLLABI
REGULATION 2023
I – V SEMESTER
CHOICE BASED CREDIT SYSTEM**

**DEPARTMENT OF ELECTRONICS AND
COMMUNICATION ENGINEERING**

**B.E. – ELECTRONICS AND COMMUNICATION
ENGINEERING**

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION

The Department of Electronics and Communication Engineering focuses to excel in teaching, learning and research in various aspects of Engineering and Technology to nurture and bring up technocrats to compete on a global platform with strong ethical values to match their skill set.

MISSION

- To pursue curricula depicting contemporary educational experience that facilitates creativity and critical thinking.
- To infuse knowledge acquisition by providing state-of- art equipment's and academic freedom to produce dynamic engineers and successful entrepreneurs.
- To collaborate with renowned Industries, International Universities, Government bodies and R&D Organizations to practice emerging technologies and gain world-wide eminence.
- To inculcate integrity, leadership qualities, social and ethical values to emerge as a responsible citizen.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

- PEO 1:** To practice in the field of Electronics and Communication Engineering in a responsible, highly commendable, and in a ethical manner in the general areas like electronics circuit design, advanced communication systems used in industrial and government organizations which is useful to the society.
- PEO 2:** To possess the necessary communication and leadership skills to function effectively in a professional multi-disciplinary environment, to cater the need for the industry.
- PEO 3:** To exhibit success in solving complex technical problems in a broad range of disciplines subject to quality engineering processes, team work activities and professional ethics.
- PEO 4:** Continue to develop professionally through life-long learning, advanced education and other creative pursuits in advanced technology, which can be exposed to the global level.

PROGRAMME OUTCOMES(POs):

At the end of the program, graduate will be able to:

PO1	Engineering Knowledge	Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems.
PO2	Problem Analysis	Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.
PO3	Design/ Development of solutions	Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.
PO4	Conduct Investigations of complex problems	Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.
PO5	Engineering Tool Usage	Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.
PO6	The Engineer and The World	Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.
PO7	Ethics	Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.
PO8	Individual and Collaborative Team work	Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
PO9	Communication	Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
PO10	Project management and finance	Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	Life-long learning	Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

PROGRAMME SPECIFIC OBJECTIVES

At the end of the program, graduate will be able to:

PSO 1:	Understand the basic concepts of electronics and apply them in the day to day life to design and execute complete engineering systems.
PSO 2:	Examine and validate electronic functional elements for numerous applications including signal processing, communication and computer networks
PSO 3:	Communicate on an intellectual level with peer engineers and others to work together to arrive at cost-effective and appropriate solution to various problems at hand.



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**DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING**

R 2023 – SUGGESTED CURRICULUM

B.E – ELECTRONICS AND COMMUNICATION ENGINEERING

Description / Semester	AICTE	SNSCT Suggested	Sem 1	Sem 2	Sem 3	Sem 4	Sem 5	Sem 6	Sem 7	Sem 8
Humanity, Social Science & Mandatory (HSMC)	15	11	4	3		2			2	
Basic Science (BSC)	23	26	8	8	5	5				
Engineering Sciences (ESC)	17	20	8	10		2				
Programme Core (PCC)	61	58			16	14	13	10	5	
Programme Elective (PEC)	12	15					3	3	3	6
Open Elective (OEC)	12	9					3	3	3	
Project/Seminar/Internship (EEC)	20	30	3	1	3	1	5	3	2	12
Mandatory Courses (MC)	(Non Credit)									
TOTAL	160*	169	23	22	24	24	24	19	15	18

SEMESTER I											
S.No.	Course Code	Course	L	T	P	Contact Hrs/week	Credit	Int/Ext	Category	Pre-requisites	
Theory Courses											
1	23MAT101	Matrices and Calculus	3	1	0	4	4	40/60	BSC		
2	23ENT101	Communicative English	3	0	0	3	3	40/60	HSMC		
3	23CHT101	Engineering Chemistry	3	0	0	3	3	40/60	BSC		
4	23ITT101	Programming in C and Data Structures	3	0	0	3	3	40/60	ESC		
5	23GET102	Basic Civil and Mechanical Engineering	3	0	0	3	3	40/60	ESC		
6	23GET103	Heritage of Tamils	1	0	0	1	1	40/60	HSMC		
Theory Integrated Practical Courses											
7	23GEB101	Design Thinking and Innovation	1	0	4	5	3	50/50	EEC		
Practical Courses											
8.	23CHP101	Chemistry Laboratory	0	0	2	2	1	60/40	BSC		
9.	23ITP101	Programming in C and Data Structures	0	0	4	4	2	60/40	ESC		
Mandatory Course											
10	23HST101	3 Weeks Induction Program								MC	
11	23HST103	Indian Constitution	2	0	0	2	0	100/0	MC		
Total			19	1	10	30	23				

SEMESTER II										
S.No.	Course Code	Course	L	T	P	Contact Hrs/week	Credit	Int/Ext	Category	Pre-requisites
Theory Courses										
1.	23MAT102	Complex Analysis and Laplace Transforms	3	1	0	4	4	40/60	BSC	23MAT101
2.	23PYT102	Physics for Engineers	3	0	0	3	3	40/60	BSC	
3.	23ECT101	Basics of Electrical Engineering and Instrumentation	2	0	0	2	2	40/60	ESC	
4.	23GET104	Tamils and Technology	1	0	0	1	1	40/60	HSMC	
Theory Integrated Practical Courses										
5.	23MEB101	Engineering Graphics	1	0	2	3	2	50/50	ESC	
6.	23ECB101	Circuit Analysis and Devices	3	0	2	5	4	50/50	ESC	
Practical Courses										
7.	23ENP101	Professional Communication	0	0	4	4	2	60/40	HSMC	
8.	23PYP101	Physics Laboratory	0	0	2	2	1	60/40	BSC	
9.	23GEP101	Workshop Practices Laboratory	0	0	4	4	2	60/40	ESC	
10.	23ECP101	Internship-I				2 Weeks	1	100/0	EEC	
Mandatory Course										
11.	23CHT103	Environmental Science and Sustainability	2	0	0	2	0	100/0	MC	
Total			15	1	14	30	22			

SEMESTER III

S.No.	Course Code	Course	L	T	P	Contact Hrs/week	Credit	Int/Ext	Category	Pre-requisites
Theory Courses										
1.	23MAT201	Partial Differential Equations and Transforms	3	0	0	3	3	40/60	BSC	
2.	23ECT201	Electronic Circuits	3	0	0	3	3	40/60	PCC	23ECB101
3.	23ECT202	Signals and Systems	3	0	0	3	3	40/60	PCC	
4.	23CST205	Object Oriented Programming using JAVA	3	0	0	3	3	40/60	PCC	23ITT101
5.	23GET275	VQAR-I	2	0	0	2	2	40/60	BSC	
Theory Integrated Practical Courses										
6.	23ECB201	Digital Systems Design	3	0	2	5	4	50/50	PCC	
Practical Courses										
7.	23ECP201	Electronic Circuits Laboratory	0	0	3	3	1.5	60/40	PCC	
8.	23CSP205	Object Oriented Programming using JAVA Laboratory	0	0	3	3	1.5	60/40	PCC	
9.	23GEP275	Personal Branding	0	0	4	4	2	60/40	EEC	
10.	23ECP202	Mini Project - I	0	0	2	2	1	100/0	EEC	
Total			17	0	14	31	24			

SEMESTER IV

S.No.	Course Code	Course	L	T	P	Contact Hrs/week	Credit	Int/Ext	Category	Pre-requisites
Theory Courses										
1.	23MAT203	Probability and Random Processes	3	0	0	3	3	40/60	BSC	
2.	23ECT203	Digital Signal Processing	3	0	0	3	3	40/60	PCC	23ECT202
3.	23ECT204	Linear Control Systems	3	0	0	3	3	40/60	PCC	
4.	23ECT205	Electromagnetic Fields and Waves	3	0	0	3	3	40/60	PCC	
5.	23GET276	VQAR-II	2	0	0	2	2	40/60	BSC	
Theory Integrated Practical Courses										
6.		Language Elective	1	0	2	3	2	50/50	HSMC	
7.	23ECB202	Linear Integrated Circuits	3	0	2	5	4	50/50	PCC	23ECT201
Practical Courses										
8.	23ECP203	Digital Signal Processing Laboratory	0	0	2	2	1	60/40	PCC	
9.	23ITP204	Programming in Python	0	0	4	4	2	60/40	ESC	
10.	23ECP204	Internship-II				2 Weeks	1	100/0	EEC	
Total			18	0	10	28	24			

SEMESTER V										
S.No	Course Code	Course	L	T	P	Contact Hrs/week	Credit	Int/Ext	Category	Pre-requisites
Theory Courses										
1.	23ECT301	Communication Systems	3	0	0	3	3	40/60	PCC	
2.	23ECT302	VLSI System Design	3	0	0	3	3	40/60	PCC	23ECB201
3.		Professional Elective - I	3	0	0	3	3	40/60	PEC	
4.		Open Elective - I	3	0	0	3	3	40/60	OEC	
Theory Integrated Practical Courses										
5.		Career Course -I	2	0	4	6	4	50/50	EEC	
6.	23ECB301	Microcontroller and its applications	3	0	2	5	4	50/50	PCC	
Practical Courses										
7.	23ECP301	Communication Systems Laboratory	0	0	4	4	2	60/40	PCC	
8.	23ECP302	VLSI System Design Laboratory	0	0	2	2	1	60/40	PCC	
9.	23ECP303	Mini Project – II	0	0	2	2	1	100/0	EEC	
Total			17	0	14	31	24			

SEMESTER VI										
S.No	Course Code	Course	L	T	P	Contact Hrs/week	Credit	Int/Ext	Category	Pre-requisites
Theory Courses										
1.	23ECT303	Embedded systems and IoT	3	0	0	3	3	40/60	PCC	23ECB301
2.	23ECT304	Antennas and Wave Propagation	3	0	0	3	3	40/60	PCC	23ECT301
3.	23ECT305	Optical and Microwave Engineering	3	0	0	3	3	40/60	PCC	
4.		Professional Elective - II	3	0	0	3	3	40/60	PEC	
5.		Open Elective - II	3	0	0	3	3	40/60	OEC	
Theory Integrated Practical Courses										
6.		Career Course -II	1	0	2	3	2	50/50	EEC	
Practical Courses										
7.	23ECP304	Optical and Microwave Engineering Laboratory	0	0	2	2	1	60/40	PCC	
8.	23ECP305	Internship-III	2 Weeks				1	100/0	EEC	
Mandatory Course										
9.	23HST105	Essence of Indian Traditional Knowledge	2	0	0	2	0	100/0	MC	
Total			18	0	4	22	19			

SEMESTER VII

S No.	Course Code	Course	L	T	P	Contact Hrs/week	Credit	Int/Ext	Category	Pre-requisites
Theory Courses										
1.	23ECT401	Wireless Communication	3	0	0	3	3	40/60	PCC	23ECT301
2.	23ECT402	Artificial Intelligence and Machine Learning	2	0	0	2	2	40/60	PCC	
3.	23GET401	Universal Human Values	2	0	0	2	2	40/60	HSMC	
4.		Professional Elective - III	3	0	0	3	3	40/60	PEC	
5.		Open Elective - III	3	0	0	3	3	40/60	OEC	
Practical course										
6.	23ECP401	Project - I	0	0	4	4	2	60/40	EEC	
		Total	13	0	4	17	15			

SEMESTER VIII

S No.	Course Code	Course	L	T	P	Contact Hrs/week	Credit	Int/Ext	Category	Pre-requisites
Theory Courses										
1.		Professional Elective - IV	3	0	0	3	3	40/60	PEC	
2.		Professional Elective - V	3	0	0	3	3	40/60	PEC	
Practical course										
3.	23ECP402	Project - II	0	0	24	24	12	60/40	EEC	
		Total	6	0	24	30	18			

1. Humanities, Social Sciences and Management Courses

S.No	Course Code	COURSES OFFERED	L	T	P	C	Sem
1.	23ENT101	Communicative English	3	0	0	3	I
2.	23GET103	Heritage of Tamils	1	0	0	1	I
3.	23GET104	Tamils and Technology	1	0	0	1	II
4.	23ENP101	Professional Communication	0	0	4	2	II
5.	Language Elective						
		Hindi	1	0	2	2	IV
		Japanese					
		German					
	French						
6.	23GET401	Universal Human Values	2	0	0	2	VII
TOTAL			8	0	6	11	

CAREERCOURSES

S.No	Course Code	Courses Offered	Sem	L	T	P	C
Track 1 Job (6 Credits)	23GEB375	Personnel Psychology & Technical Interviewing	V Semester	2	0	4	4
	23GEB379	Employable Skill Development	VI Semester	1	0	2	2
Track 2 Entrepreneurship (6 Credits)	23GEB376	Entrepreneurship & Business Canvas Model	V Semester	2	0	4	4
	23GEB382	Economics, Finance & Accounting and Intellectual Property Rights	VI Semester	1	0	2	2
Track 3 Higher Education (6 Credits)	23GEB377	Advanced Verbal Quantitative Aptitude & Reasoning and Networking	V Semester	2	0	4	4
	23GEB380	Higher Studies in Abroad & India	VI Semester	1	0	2	2
Track 4 Govt. /RRB/ Bank (6 credits)	23GEB378	Foundation Course on Competitive Exams	V Semester	2	0	4	4
	23GEB381	Personnel Psychology for Govt. Jobs	VI Semester	1	0	2	2

2. Basic Science Courses

S.No	Course Code	COURSES OFFERED	L	T	P	C	Sem
1.	23MAT101	Matrices and Calculus	3	1	0	4	I
2.	23CHT101	Engineering Chemistry	3	0	0	3	I
3.	23CHP101	Chemistry Laboratory	0	0	2	1	I
4.	23MAT102	Complex Analysis and Laplace Transforms	3	1	0	4	II
5.	23PYT102	Physics for Engineers	3	0	0	3	II
6.	23PYP101	Physics Laboratory	0	0	2	1	II
7.	23MAT201	Partial Differential Equations and Transforms	3	0	0	3	III
8.	23GET275	VQAR-I	2	0	0	2	III
9.	23MAT203	Probability and Random Processes	3	0	0	3	IV
10.	23GET276	VQAR-II	2	0	0	2	IV
TOTAL			22	2	4	26	

3. Engineering Science Courses

S.No	Course Code	COURSES OFFERED	L	T	P	C	Sem
1.	23ITT101	Programming in C and Data Structures	3	0	0	3	I
2.	23GET102	Basic Civil and Mechanical Engineering	3	0	0	3	I
3.	23ITP101	Programming in C and Data Structures	0	0	4	2	I
4.	23ECT101	Basics of Electrical Engineering and Instrumentation	2	0	0	2	II
5.	23MEB101	Engineering Graphics	1	0	2	2	II
6.	23ECB101	Circuit Analysis and Devices	3	0	2	4	II
7.	23GEP101	Workshop Practices Laboratory	0	0	4	2	II
8.	23ITP204	Programming in Python	0	0	4	2	IV
TOTAL			12	0	16	20	

4. Professional Core Courses

S.No.	Course Code	COURSES OFFERED	L	T	P	C	Sem
1.	23ECT201	Electronic Circuits	3	0	0	3	III
2.	23ECT202	Signals and Systems	3	0	0	3	III
3.	23CST205	Object Oriented Programming using JAVA	3	0	0	3	III
4.	23ECB201	Digital Systems Design	3	0	2	4	III
5.	23ECP201	Electronic Circuits Laboratory	0	0	3	1.5	III
6.	23CSP205	Object Oriented Programming using JAVA Laboratory	0	0	3	1.5	III
7.	23ECT203	Digital Signal Processing	3	0	0	3	IV
8.	23ECT204	Linear Control Systems	3	0	0	3	IV
9.	23ECT205	Electromagnetic Fields and Waves	3	0	0	3	IV
10.	23ECB202	Linear Integrated Circuits	3	0	2	4	IV
11.	23ECP203	Digital Signal Processing Laboratory	0	0	2	1	IV

12.	23ECT301	Communication Systems	3	0	0	3	V
13.	23ECT302	VLSI System Design	3	0	0	3	V
14.	23ECB301	Microcontroller and its applications	3	0	2	4	V
15.	23ECP301	Communication Systems Laboratory	0	0	4	2	V
16.	23ECP302	VLSI System Design Laboratory	0	0	2	1	V
17.	23ECT303	Embedded systems and IoT	3	0	0	3	VI
18.	23ECT304	Antennas and Wave Propagation	3	0	0	3	VI
19.	23ECT305	Optical and Microwave Engineering	3	0	0	3	VI
20.	23ECP304	Optical and Microwave Engineering Laboratory	0	0	2	1	VI
21.	23ECT401	Wireless Communication	3	0	0	3	VII
22.	23ECT402	Artificial Intelligence and Machine Learning	2	0	0	2	VII
TOTAL			47	0	22	58	

5. Professional Elective Courses

S.No	Course Code	COURSES OFFERED	L	T	P	C	Sem
1.		Professional Elective-I	3	0	0	3	V
2.		Professional Elective– II	3	0	0	3	VI
3.		Professional Elective– III	3	0	0	3	VII
4.		Professional Elective– IV	3	0	0	3	VIII
5.		Professional Elective– V	3	0	0	3	VIII
TOTAL			15	0	0	15	

Professional Elective Courses

S.No.	Course Code	COURSES OFFERED	L	T	P	C
Professional Elective– I						
1.	23ECE301	Digital Image Processing	3	0	0	3
2.	23ECE302	Flexible Electronics	3	0	0	3
3.	23ECE303	Advanced Digital Signal Processing	3	0	0	3
4.	23ECE304	Smart sensors and Devices	3	0	0	3
5.	23ECE305	Multimedia Compression Techniques	3	0	0	3
6.	23ECE306	Computer Vision	3	0	0	3

6. Open Elective Courses Offered to Other Programmes

S.No.	Course Code	COURSES OFFERED	L	T	P	C
1.	23ECO301	Advanced Mobile Communication	3	0	0	0
2.	23ECO302	Embedded System Design using Arduino	3	0	0	0
3.	23ECO303	Basics of Sensor Technology	3	0	0	0
4.	23ECO304	Measuring Instruments	3	0	0	0
5.	23ECO305	Consumer Electronics	3	0	0	0
6.	23ECO306	Microcontroller for Industrial applications	3	0	0	0

7. Employment Enhancement Courses

S.No.	Course Code	COURSES OFFERED	L	T	P	C	Sem
1.	23GEB101	Design Thinking and Innovation	1	0	4	3	I
2.	23ECP101	Internship-I	2 Weeks			1	II
3.	23GEP275	Personal Branding	0	0	4	2	III
5.	23ECP202	Mini Project - I	0	0	2	1	III
6.	23ECP204	Internship-II	2Weeks			1	IV
7.		Career Course -I	2	0	4	4	V
8.	23ECP303	Mini Project – II	0	0	1	1	V
9.		Career Course -II	1	0	2	2	VI
10.	23ECP305	Internship-III	2Weeks			1	VI
11.	23ECP401	Project - I	0	0	4	2	VII
12.	23ECP402	Project - II	0	0	24	12	VIII
TOTAL			4	0	45	30	

8. Mandatory Courses

S.No	Course Code	COURSES OFFERED	L	T	P	C	Sem
1.	23HST101	Induction Program	3 Weeks			0	I
2.	23HST103	Indian Constitution	2	0	0	0	I
3.	23CHT103	Environmental Science and Sustainability	2	0	0	0	II
4.	23HST105	Essence of Indian Traditional Knowledge	2	0	0	0	VI
TOTAL			6	0	0	0	0

SEMESTER I

23MAT101	MATRICES AND CALCULUS	L	T	P	C
[Common to all B.E. / B. Tech. Courses]		3	1	0	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To develop the use of matrix algebra techniques that is needed by engineers for practical applications. • To acquaint the student with mathematical tools needed in evaluating differential calculus, multiple integrals and their applications. 					
UNIT I	MATRIX EIGENVALUE PROBLEM	12			
Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Cayley Hamilton Theorem (statement only) and it's applications – Eigenvalue problems arising from population models (Leslie model).					
UNIT II	ORTHOGONAL TRANSFORMATION OF A REAL SYMMETRIC MATRIX	12			
Diagonalization of a real symmetric matrix – Quadratic form – Canonical form – Nature of the quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation – Applications: Stretching of an elastic membrane.					
UNIT III	DIFFERENTIAL CALCULUS	12			
Curvature – Radius of Curvature in Cartesian co-ordinates – Centre of curvature and circle of curvature in Cartesian Co-ordinates – Evolutes – Envelopes.					
UNIT IV	FUNCTIONS OF SEVERAL VARIABLES	12			
Partial derivatives – Homogeneous functions and Euler's theorem – Jacobians – Taylor's series for functions of two variables – Applications: Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.					
UNIT V	MULTIPLE INTEGRALS	12			
Double integrals (Cartesian co-ordinates) – Change of order of integration – Applications of double integrals (Area) – Triple integrals (Cartesian co-ordinates) – Applications: Volume of solids.					
L:45		T:15	P: 0	Total: 60 Periods	
TEXT BOOKS					
T1	Kreyszig.E, Advanced Engineering Mathematics, John Wiley and Sons, 10 th Edition, New Delhi 2016.				
T2	James Stewart, Calculus, Cengage Learning, 8 th Edition, New Delhi 2015.				
REFERENCES					
R1	Grewal.B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44 th Edition, 2018.				
R2	Bali. N.P, Goyal. M. and Watkins. C., Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7 th Edition, 2009.				
R3	Jain. R.K. and Iyengar. S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5 th Edition, 2016.				
R4	Ramana. B.V., Higher Engineering Mathematics, McGraw Hill Education Pvt. Ltd, New Delhi, 2016.				
R5	Thomas. G. B., Hass. J, and Weir. M.D, Thomas Calculus, 14 th Edition, Pearson India, 2018.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Discuss about Eigen values and Eigen vectors and its role in the system of equations.				

CO 2	Compute the real symmetric matrix from quadratic form to canonical form by means of orthogonal transformation.
CO 3	Demonstrate the radius, centre and circle of curvature of any curve.
CO 4	Use differential calculus ideas on several variable functions.
CO 5	Apply multiple integral ideas in solving areas, volumes and other practical problems.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3		2	2			2	2		2			
C02	3	3		2	2			2	2		2			
C03	3	3		1	2			2	2		2			
C04	3	3		1	2			2	2		2			
C05	3	3		1	2			2	2		2			

23ENT101	COMMUNICATIVE ENGLISH				L	T	P	C
[Common to all B.E. / B. Tech. Courses]					3	0	0	3
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> To enhance students in the art of error-free communication, emphasizing the correct use of grammar and punctuation in both professional and social contexts. To develop students' proficiency in formal letter writing, ensuring they can convey messages clearly, concisely, and professionally in various formal scenarios. 								
UNIT I								9
Grammar - Tenses - Verb forms, Spelling and Importance of Punctuation, Vocabulary - Word formation- Prefixes & Suffixes, One word Substitution, Reading -Reading and understanding the Context, Writing - Sentence completion- filling the gap, Instructions-Imperative Instructions.								
UNIT II								9
Grammar - Uses of Preposition, Active & Passive Voice- impersonal passive, Vocabulary - Technical Vocabulary- Synonyms-Antonyms-Compound words, Reading -Transfer of information (chart, pictures), Writing - Recommendations- writing suggestions, Preparing Checklist.								
UNIT III								9
Grammar -Concord (Subject & Verb agreement), Definite & Indefinite Article, Vocabulary - Uses of Connectives and Linking words, Reading - Summarizing the given passage - Précis writing, Writing - Paragraph writing – Process writing, Analytical, Argumentative Paragraphs.								
UNIT IV								9
Grammar - Direct and Indirect speech, Cause and Effect Expression, Vocabulary - Logical sequence of words, Reading -Note-making using Linear method, Writing - Formal Letter writing- Permission letter for Industrial Visit & In-plant training.								
UNIT V								9
Grammar - Clauses -If Conditionals, Vocabulary - Words often confused - Verbal Analogy, Reading - Writing a Book Review, Writing - Business Letters- Letter of Quotations, Clarification, Placing orders & Complaint letter.								
					L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS								
T1	Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, New Delhi, 2011.							
T2	Rizvi, Ashraf. M. Effective Technical Communication, Tata McGraw-Hill, New Delhi, 2005.							
REFERENCES								
R1	Muralikrishna, & Sunita Mishra. Communication Skills for Engineers. Pearson, New Delhi. 2011							
R2	Mitra K. Barun, –Effective Technical Communication – A Guide for Scientists and Engineers , Oxford University Press, New Delhi, 2006.							
R3	Leo Jones, Richard Alexander, New International Business English, updated Edition, Cambridge University Press, NY, USA.							
R4	Smith—Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage,Mason USA.							
R5	Sharon J. Gerson, Steven M. Gerson, –Technical Writing – Process & Product . 3rd Edition, Pearson Education (Singapore) (P) Ltd., New Delhi.							
COURSE OUTCOMES								
At the end of the course students should be able to								

CO 1	Use their active and passive vocabulary and construct basic sentence structures
CO 2	Assess the different interpretations of ambiguous passages by comparing and contrasting various analyses.
CO 3	Select appropriate formatting styles for various documents to enhance readability and professionalism while adhering to grammatical norms.
CO 4	Utilize their letter writing skills to build rapport and convey important messages clearly in formal settings.
CO 5	Build their communication skills and enable them to articulate with confidence.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PSO1	PSO2	PSO3
C01		1		1		1	1	3	3	1	1			
C02		1		1		2	2	3	3	3	3			
C03		1		1		2	3	3	3	3	3			
C04		1		1		2	2	3	3	3	3			
C05		1		1		2	2	3	3	3	3			

23CHT101	ENGINEERING CHEMISTRY				L	T	P	C
[Common to CSE, ECE, EEE, IT, AIML, & BME]					3	0	0	3
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> To develop a deep understanding of electrochemical principles and their applications in modern power sources, focusing on innovative technologies and sustainable solutions. To equip students with advanced knowledge and skills in nanotechnology, polymers, composites, and analytical techniques, enabling them to contribute to cutting-edge research and industrial applications. 								
UNIT I	ELECTROCHEMISTRY							9
Electrode potential- Nernst equation - Reference electrodes - Standard hydrogen electrode - Calomel electrode - Ion selective electrode - Measurement of pH by glass electrode - Electrochemical series -Electrochemical cell - Galvanic cell - measurement of EMF - Electrolytic cell - Electrolysis -Electroplating (Au).								
UNIT II	ELECTROCHEMICAL POWER SOURCES							9
Batteries – Types - Characteristics – Classification - Construction and working of Alkaline battery -Lead acid battery - Modern batteries - Lithium ion battery, Zinc Air Battery, Super capacitors - Fuel cells - construction and working of H ₂ -O ₂ fuel cell - Hydrogen as fuel - Production and storage								
UNIT III	NANOMATERIALS							9
Nano materials and Bulk materials - Size dependent properties (Optical, Electrical and Mechanical) –Synthesis - Sol gel method - Chemical Vapour Deposition, Solvothermal, laser ablation - Carbon nanotubes – Properties and uses - Applications of Nanotechnology in Electronics, Energy science and Medicine.								
UNIT IV	POLYMERS AND COMPOSITES							9
Polymers – Classification - Degree of Polymerization - Industrially important polymers – Preparation, Properties and uses of PE, PVC and Polypropylene. Engineering polymers-Preparation, Properties and uses of Nylon-6, 6, Teflon & Bakelite. Organic polymers - Preparation, Properties and uses of Poly acetylene and Poly lactide. Composites – Fibre Reinforced Plastics								
UNIT V	ANALYTICAL TECHNIQUES AND ELECTRONIC MATERIALS							9
Spectroscopic Techniques-Basic principle and instrumentation of UV-Visible, AAS and Flame photometry. Liquid crystalline displays - Fundamentals, Process and applications. Organic LEDs - their functioning – advantages and disadvantages over conventional LEDs - their commercial uses.								
L:45					T:0	P: 0	Total: 45 Periods	
TEXT BOOKS								
T1	P. C. Jain and Monica Jain, Engineering Chemistry, 17th Edition, DhanpatRai Publishing Company (P) Ltd, New Delhi, 2018							
T2	Wiley, “Engineering Chemistry”, John Wiley & Sons .InC, USA (2014]							
REFERENCES								
R1	B. Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub. Co. Ltd, New Delhi (2009).							
R2	B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, “Text book of nanoscience and nanotechnology”, Universities Press-IIM Series in Metallurgy and Materials Science, 2018							
R3	Dr.Sivanesan and Nandagopal, “Engineering Chemistry-I” V.K.Pub.Pvt.Ltd. 2011.							
R4	Shikha Agarwal, Engineering Chemistry-Fundamentals and Applications, Cambridge University Press, Delhi, Second Edition, 2019.							
R5	Dara, S.S.; A Text Book of Engineering Chemistry (Tenth edition); S. Chand, 2003							
COURSE OUTCOMES								

At the end of the course students should be able to	
CO 1	Understand the concepts of electrode potential and electrochemical cells, applying the Nernst equation to solve complex electrochemical problems
CO 2	Analyze the construction, working, and performance of various batteries and fuel cells to select appropriate power sources for specific applications.
CO 3	Compare the properties of nanomaterials with bulk materials, and demonstrate the synthesis of nanomaterials, while exploring their applications in electronics, energy, and medicine.
CO 4	Describe the preparation, properties, and uses of important industrial and organic polymers and evaluate their role in creating composites like fiber-reinforced plastics.
CO 5	Utilize various spectroscopic techniques to interpret experimental data and explore the functioning and applications of liquid crystalline displays and organic LEDs in modern technology.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3												
C02	3	3	2			1					1			
C03	3	3	2	2		1					1			
C04	3	3	2			1								
C05	3	2		2	1						1			

23ITT101	PROGRAMMING IN C AND DATA STRUCTURES				L	T	P	C
[Common to BME, Mech, MCT, and ECE]					3	0	0	3
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> To make students to learn, design & develop their programming skills. To gain knowledge of data structures and their applications. 								
UNIT I	INTRODUCTION TO C							8
Basic blocks of computers – Algorithm, Pseudo code, Flowchart - Structure of C program- Data types - Variables - Constants, Operators - Input and Output Statements								
UNIT II	DECISIONS STATEMENTS AND FUNCTIONS							11
Decision making and Branching statements - Looping statements, Functions, Call by value, Call by reference								
UNIT III	ARRAYS AND INTRODUCTION TO DATA STRUCTURES							10
Arrays - One dimensional arrays - Two dimensional Arrays - Structures – Pointers Introduction to Data structures - Types of Data structures - ADT								
UNIT IV	STACK AND QUEUE							9
Stack ADT - Queue ADT - Array implementation of Queue and Stack ADT - Infix to Postfix conversion - Postfix expression evaluation								
UNIT V	TREES							7
Trees - Binary Tree - Binary Search Tree - Insertion and Deletion Operation - Tree Traversal								
L:45					T:0	P: 0	Total: 45 Periods	
TEXT BOOKS								
T1	Kamthane Ashok, "Programming in C, Pearson Education India 3/e, 3rd Edition, 2015.							
T2	Aaron M. Tenenbaum, Yedidyah Langsam, Moshe Augenstein, "Data Structures using C", Prentice-Hall of India, 2003							
REFERENCES								
R1	A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, 2nd Edition, 2007							
R2	E.Balagurusamy "Data Structures Using C ", McGraw-Hill Education (India) , 2013							
COURSE OUTCOMES								
At the end of the course students should be able to								
CO 1	Develop algorithms and design flowcharts to solve real-world problems effectively.							
CO 2	Understand and apply decision-making constructs, branching, and looping statements in program development.							
CO 3	Implement functions and arrays, and utilize basic data structures such as stacks and queues.							
CO 4	Gain in-depth knowledge of stack and queue data structures, and their applications in various computational problems.							
CO 5	Understand tree data structures and perform operations on trees, equipping them with the necessary skills to manage and manipulate hierarchical data.							

23GET102	BASIC CIVIL AND MECHANICAL ENGINEERING	L	T	P	C
[Common to CSE, ECE,EEE, IT,AIML and BIO]		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • Provide knowledge about the fundamental concepts, principles, and practices of civil engineering, covering, materials, Surveying, and Building Components. • Instill a solid understanding of fundamental concepts of Mechanical Engineering in Manufacturing, IC engines and Refrigeration and Air Conditioning systems. 					
UNIT I	CIVIL ENGINEERING MATERIALS AND SURVEYING	11			
Introduction: Civil engineering - scope of civil engineering - building materials - Brick, stone, cement, concrete, properties – uses - Surveying: Objects – types – classification – principles – measurements of distances – angles – Concepts of levelling – determination of areas – illustrative examples.					
UNIT II	BUILDING COMPONENTS	10			
Sub Structure: Types of foundation - Bearing capacity – Requirement of good foundations. Superstructure: Types of structure - Types of masonry – beams – columns – lintels – roofing – flooring – plastering.					
UNIT III	OVERVIEW OF MECHANICAL ENGINEERING	8			
Basics of Foundry – Welding and its types – 3D Printing – Lathe and its types - Mechanical & Automation - Interdisciplinary concepts in Mechanical Engineering.					
UNIT IV	IC ENGINES AND POWER PLANT ENGINEERING	8			
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles –. Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric, Nuclear and Solar Power plants – Merits and Demerits.					
UNIT V	REFRIGERATION AND AIR CONDITIONING SYSTEM	8			
Terminology of Refrigeration and Air Conditioning. Principle of vapor compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner - Properties of air – water mixture, concepts of psychometric and its process.					
		L:45	T: 0	P: 0	Total: 45 Periods
TEXT BOOKS					
T1	Naveen Sait.A, Soundararajan.R, “Basic Civil and Mechanical Engineering”, RP Publications, Coimbatore, (2017). (Unit I,II,III,IV,V)				
T2	Venugopal K and Prahua Raja V, “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, (2017). (Unit III,IV,V)				
REFERENCES					
R1	Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, (2017). (Unit I,II,III,IV,V)				
R2	Rangwala,S.C, “ Engineering Materials” , Charotar Publishing House, Anand, 2016. (Unit I)				
R3	Rao, PN, “Manufacturing Technology: Foundry, Forming and Welding”, Tata McGraw-Hill, New Delhi, 2016. (Unit III)				
R4	Jonathan Wickert, & Kemper Lewis “An Introduction to Mechanical Engineering”, Jonathan Wickert and Kemper E. Lewis, Third Edition(2017). (Unit III,IV,V)				
R5	RS Khurmi & JK Gupta, “Refrigeration and Air Conditioning”, S. Chand Publishing 2018. (Unit V)				
COURSE OUTCOMES					
At the end of the course students should be able to					

CO 1	Describe about building materials & surveying equipment's in real time.
CO 2	Outline the basic building components and requirements of good foundation.
CO 3	Identify the possibilities of energy conversion from various energy sources using power plants.
CO 4	Summarize the working principles of various Mechanical systems used in day to day applications.
CO 5	Apply the various basic Manufacturing processes to make products.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	1					1			1					
C02	1					1			1					
C03	3	1				1					2	1		
C04	3		1		1								2	
C05	3				1						2			

23GET103	HERITAGE OF TAMILS				L	T	P	C
[Common to all B.E. / B. Tech. Courses]					1	0	0	1
UNIT I	LANGUAGE AND LITERATURE							3
Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature- Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.								
UNIT II	HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE							3
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhanganam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.								
UNIT III	FOLK AND MARTIAL ARTS							3
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.								
UNIT IV	THINAI CONCEPT OF TAMILS							3
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.								
UNIT V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE							3
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.								
					L:55	T:0	P: 0	Total: 15 Periods
TEXT BOOKS & REFERENCES								
1	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL							
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies)							
3	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies)							
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies)							
5	Keeladi - 'Sangam City Civilization on the banks of river Vaigai'							
6	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay)							
7	Porunai Civilization Journey of Civilization Indus to Vaigai (R.Balakrishnan)							

23GEB101	DESIGN THINKING AND INNOVATION				L	T	P	C	
[Common to to all B.E. / B. Tech. Courses]					1	0	4	3	
UNIT I	INTRODUCTION TO DESIGN THINKING							3+12	
A brief insight to Design Thinking and Innovation- People Centered Design & Evoking the 'right problem'- Purpose of Design Thinking- Design Thinking Framework.									
UNIT II	PROCESS IN DESIGN THINKING (EMPATHY, DEFINE)							3+12	
Design Thinking Process – Empathy – Uncovering and Investigating Community Concerns - Define: Examine and Reflect on the problem.									
UNIT III	CONCEPTING AND BUILDING (IDEA, CREATE)							3+12	
Generating Ideas-Identifying top three ideas-Bundling the Ideas and create concepts-Rapid Prototyping.									
UNIT IV	TESTING, REFINING AND PITCHING THE IDEAS							3+12	
Importance & Testing the Design with People-Retest and Redefine Results-Creating a Pitch for the design.									
UNIT V	VALUE PROPOSITION DESIGN							3+12	
Business Vs Startup-Briefing the Problem-Problem Validation and User Discovery- Challenge Brief.									
L:15					T:0		P: 60		Total: 75 Periods
TEXT BOOKS									
T1	Robert A Curedale0, Design Thinking Process & Methods 4th Edition, December 2017, Design Community College Inc.								
T2	Andrew Pressman, Design Thinking: A Guide to Creative Problem Solving for Everyone, First Edition, Nov 2018, Routledge.								
REFERENCES									
R1	Idris Mootee, Design Thinking for Strategic Innovation - What They Can't Teach You at Business or Design School, First Edition, 2017, Wiley.								
R2	Yves Pigneur, Greg Bernarda, Alan Smith, Trish Papadacos Alex Osterwalder, Value Proposition Design: How to Create Products and Services Customers Want, 2015, Wiley.								
R3	Brown, Tim, and Barry Katz. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, 2009, Harper Business.								
COURSE OUTCOMES									
At the end of the course students should be able to									
C01	Learn new approach-design thinking—that enhances innovation activities in terms of market impact, value creation, and speed								
C02	Feel the Empathy and can define their problems based on the Community Concerns								
C03	Strengthen their individual and collaborative capabilities to identify customer needs, create sound concept hypotheses, collect appropriate data, and develop a prototype that allows for meaningful feedback in a real-world environment								
C04	Translate broadly defined opportunities into actionable innovation possibilities and recommendations for client organization								
C05	Become an Entrepreneurs								

23CHP101	CHEMISTRY LABORATORY	L	T	P	C
[Common to all B.E. / B. Tech. Courses]		0	0	2	1
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To inculcate experimental skills to test basic understanding of water quality parameters, such as acidity, alkalinity, hardness, DO, chloride and copper. To induce the students to familiarize with electro analytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions. 					
LIST OF EXPERIMENTS					
1. Estimation of alkalinity of water sample by indicator method					
2. Determination of hardness of water sample by EDTA method					
3. Estimation of Dissolved oxygen in water sample by Winkler's method					
4. Estimation of Chloride in water sample by Argentometric method					
5. Estimation of copper in brass by EDTA method					
6. Determination of strength of HCl and CH ₃ COOH present in a mixture conductometrically					
7. Estimation of strength of iron by potentiometric titration					
8. Determination of molecular weight of given polymer by Ostwald's viscometer					
9. Determination of Strength of HCl by pH metry					
10. Determination of corrosion rate of mild steel by weight loss method					
DEMO EXPERIMENTS					
11. Synthesis of nanomaterials by chemical precipitation method					
12. Estimation of strength of iron by spectrophotometry					
		L:0	T:0	P: 30	Total: 30 Periods
TEXT BOOKS					
T1	Department of Chemistry SNSCT "Chemistry Laboratory Manual", 2019				
REFERENCES					
R1	J.Mendham, R.C.Denney, J.D.Bames, M.Thomas and B.Sivasankar, Vogel's "Text book of Quantitative chemical analysis", 6th edition, EBS, 2009.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Analyze the quality of water samples through basic techniques				
CO 2	Estimate the amount of metal ions in domestic and industry water				
CO 3	Determine the absolute viscosity and molecular weight of Organic solvents				
CO 4	Interpret the corrosion rate of metals				

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3	1	1		2					1			
C02	3	3	1	1		1					1			
C03	3	3	1	1		2					1			
C04	3	3	1	1		2					1			

23ITP101	PROGRAMMING IN C AND DATA STRUCTURES LABORATORY	L	T	P	C
[Common to Mech, MCT, and ECE]		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To train the student to the basic concepts of the C-programming language. • To design and analyze simple linear and nonlinear data structures 					
LIST OF EXPERIMENTS					
<ol style="list-style-type: none"> 1. Algorithms and Flow Chart <ol style="list-style-type: none"> a) Sequential b) Branching and Looping 2. Operators & Expressions <ol style="list-style-type: none"> a) Arithmetic b) Logical c) Relational 3. Condition Statements <ol style="list-style-type: none"> a) Nested if else b) Else-if Ladder 4. Looping <ol style="list-style-type: none"> a) For b) While c) Do-while 5. Functions <ol style="list-style-type: none"> a) With and without arguments b) With and without return type c) Call by value and Call by reference 6. Arrays <ol style="list-style-type: none"> a) Searching element in one dimensional array b) Matrix multiplication 7. Structures 8. Pointers 9. Implementation of Stack ADT 10. Implementation of Queue ADT 11. Implementation of Tree Traversal 12. Implementation of Binary Search Tree ADT 					
		L:0	T:0	P: 60	Total: 60 Periods
HARDWARE / SOFTWARE REQUIRED (For a Batch of 30 Students)					
Hardware <ul style="list-style-type: none"> • 30 PCs with Processor-2.0 GHz or Higher • RAM-1 GB or Higher • Hard disk-20 GB or Higher 					

23HST103	INDIAN CONSTITUTION				L	T	P	C
[Common to all B.E. / B. Tech. Courses]					2	0	0	0
UNIT I	INTRODUCTION							12
Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.								
UNIT II	STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT							12
Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.								
UNIT III	STRUCTURE AND FUNCTION OF STATE GOVERNMENT							12
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.								
UNIT IV	CONSTITUTION FUNCTIONS							12
Indian Federal System – Center – State Relations – President’s Rule – Constitutional Amendments – Constitutional Functionaries – Assessment of working of the Parliamentary System in India.								
UNIT V	ELECTION COMMISSION							12
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.								
L:30					T:0	P: 0	Total: 30 Periods	
TEXT BOOKS								
T1	Durga Das Basu, “Introduction to the Constitution of India”, Prentice Hall of India, New Delhi.							
T2	R.C.Agarwal, “Indian Political System”, S.Chand and Company, New Delhi. (1997).							
REFERENCES								
R1	Maciver and Page, “ Society: An Introduction Analysis “, Mac Milan India Ltd., New Delhi.							
R2	K.L.Sharma, “Social Stratification in India: Issues and Themes”, Jawaharlal Nehru University, New Delhi. (1997).							
R3	Sharma, Brij Kishore, “Introduction to the Constitution of India”, Prentice Hall of India, NewDelhi.							
R4	U.R.Gahai, “Indian Political System”, New Academic Publishing House, Jalaendhar.							
R5	R.N. Sharma, “Indian Social Problems”, Media Promoters and Publishers Pvt. Ltd.							
COURSE OUTCOMES								
At the end of the course students should be able to								
CO 1	Understand the functions of the Indian government,							
CO 2	Know the structure and functioning of central government.							
CO 3	Understand functioning of Indian constituent .							
CO 4	Analyze the functions of the Indian government.							
CO 5	Summarize the functioning of election commission.							

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3		2								3		
C02					3					3			2	
C03	3		3		3						1	2		
C04			3				2					3		
C05	3	3		2								3	3	

SEMESTER II

23MAT102	COMPLEX ANALYSIS AND LAPLACE TRANSFORMS	L	T	P	C
[Common to AEROSPACE, AGRI, AUTO, BME, CIVIL, ECE, EEE, FT, MECH, MCT]		3	1	0	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To develop the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current. • To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated. 					
UNIT I	VECTOR CALCULUS	12			
Derivatives: Gradient and Directional derivatives – Divergence and Curl of a vector field – Solenoidal and Irrotational of a vector – Green’s, Gauss divergence and Stoke’s theorems (statements only) – Verification of theorems and application in evaluating line, surface and volume integrals.					
UNIT II	ORDINARY DIFFERENTIAL EQUATIONS	12			
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Homogenous equation of Euler’s and Legendre’s type – Solution of system of simultaneous linear first order differential equations with constant coefficients.					
UNIT III	COMPLEX DIFFERENTIATION	12			
Derivatives of $f(z)$ – Analytic function – Cauchy-Riemann Equations – Harmonic function – Harmonic conjugate – Construction of Analytic function – Conformal Mapping – Mapping by functions: $w = z + c$, cz , $1/z$ – Bilinear transformations – Application to flow problems.					
UNIT IV	COMPLEX INTEGRATION	12			
Cauchy’s integral theorem – Cauchy’s integral formula – Taylor’s series – Zeros of an analytic function – singularities – Laurent’s series – Residues – Cauchy Residue theorem .					
UNIT V	LAPLACE TRANSFORMS	12			
Definition, properties, existence conditions – Transforms of elementary functions – Shifting theorem – Transforms of derivatives and integrals – Periodic functions – Initial and final value theorem – Inverse transforms – Application to solution of linear second order ordinary differential equations with constant coefficients.					
		L:45	T:15	P: 0	Total: 60 Periods
TEXT BOOKS					
T1	Kreyszig.E, Advanced Engineering Mathematics, John Wiley and Sons, 10th Edition, New Delhi 2016.				
T2	Grewal.B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44th Edition, 2018.				
REFERENCES					
R1	Bali. N.P, Goyal. M. and Watkins. C., Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.				
R2	G.B.Thomas, Calculus, 12th Edition, Pearson Education India, 2015.				
R3	Jain. R.K. and Iyengar. S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.				
R4	Peter V.O Neil, “Advanced Engineering Mathematics”, 7th Edition, Cengage learning India Pvt Ltd, New Delhi, 2012.				

R5	Srimanta Pal, Subodh C Bhunia, "Engineering Mathematics", Oxford University Press,2015.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Evaluate gradient, divergence and curl and solve engineering problems involving cubes, rectangular parallelepipeds by applying various integral theorems.
CO 2	Compute the higher order linear differential equations with various methods and apply them in some physical situations.
CO 3	Discuss the analyticity, construct the analytic function and transform complex functions from z-plane to w-plane graphically by using conformal mapping.
CO 4	Identify real and complex integrals over suitable closed path using various integral theorems.
CO 5	Apply the mathematical principles on Laplace transforms and would provide them the ability to formulate and solve some of the physical problems of engineering.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3						2			2			
C02	3	3						2			2			
C03	3	3						2			2			
C04	3	3						2			2			
C05	3	3						2			2			

23PYT102	PHYSICS FOR ENGINEERS			L	T	P	C
[Common to AIML,BME,CSE,ECE,EEE & IT]				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To comprehend and classify different crystal structures and impart the knowledge about conductors, superconductors and semiconductors. To build knowledge about magnetism and understand the origin of laser action, fibre optics and their applications. 							
UNIT I	CRYSTAL STRUCTURE						9
Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, Miller indices, directions and planes in a crystal – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP structures - Crystal imperfections –point, line, surface and volume imperfections.							
UNIT II	CONDUCTING AND SUPERCONDUCTING MATERIALS						9
Conductors: classical free electron theory – electrical conductivity - Success and failures of classical free electron theory - Quantum free electron theory of metals - Fermi distribution function - Density of energy states for a metal – Carrier concentration in a metal. Superconductors: properties – Meissner effect – type I & II superconductors – BCS theory–Applications: Superconducting Quantum Interference Device (SQUID), Magnetic levitation.							
UNIT III	SEMICONDUCTOR PHYSICS						9
Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors– Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors - Hall effect –Determination hall coefficient – Applications –Photo detectors (PIN & Avalanche).							
UNIT IV	MAGNETISM						9
Basic concepts – magnetic moment, susceptibility, permeability - Origin of magnetic moment – Bohr magneton – Dia, Para and Ferro magnetism – Domain theory – Hysteresis– soft and hard magnetic materials – anti ferromagnetic materials – Ferrites and its applications - Magnetic storage devices- magnetic hard disc, bubble memory.							
UNIT V	LASER AND FIBRE OPTICS						9
Spontaneous and stimulated emission - Population inversion - Einstein’s A and B coefficients- Types of lasers – CO ₂ , Semiconductor lasers - Industrial and Medical Applications. Optics Fibre: Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – Losses in optical fibre- attenuation, dispersion, bending-Fibre Optical Communication system (Block diagram).							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	S.O. Pillai, “Solid State Physics”, 10th Edition, 2023, New Age International Private Limited.						
T2	R Murugesan & Kiruthiga Sivaprasath, “Modern Physics”,18th edition, 2019 S.Chand Publishing.						
REFERENCES							
R1	Rajendran.V, “Engineering Physics”,2017, Tata Mcgraw-Hill Publishing Company Limited, NewDelhi.						
R2	D.K.Battacharya, Poonam Tandon, “Engineering Physics”, 2017 Oxford University Press.						
COURSE OUTCOMES							

At the end of the course students should be able to	
CO 1	Analyze crystal structures and the influence of imperfections on their properties.
CO 2	Apply the knowledge to develop the conductors and superconductors for specific applications.
CO 3	Utilize the fundamentals of semiconductor physics and its applications.
CO 4	Identify the properties of magnetic materials and their applications.
CO 5	Create the knowledge on fundamental concepts of laser, fibre optics and its applications.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PSO1	PSO2	PSO3
C01	3	2									2			
C02	3	2									2			
C03	3	2	1								2			
C04	3	2									2			
C05	3	2	1		1						2			

23ECT101	BASICS OF ELECTRICAL ENGINEERING AND INSTRUMENTATION			L	T	P	C
				2	0	0	2
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To give an overview of current, voltage and power measuring electrical, electronics and digital instruments. To expose the students to the design of bridges for the measurement of resistance, capacitance and inductance 							
UNIT I	DC MACHINES						6
Construction of DC machines – Theory of operation of DC generators – Characteristics of DC generators- Operating principle of DC motors – Types of DC motors and its applications							
UNIT II	TRANSFORMER						6
Introduction – Single phase transformer construction and principle of operation – Types of Transformers – EMF equation of transformer – Open and Short Circuit test							
UNIT III	INDUCTION MACHINES						6
Single phase induction motor - Construction –Principle of Operation – Types - Three phase induction motor –Construction – Principle of operation- Types of Three phase IM							
UNIT IV	BASICS OF MEASUREMENT AND INSTRUMENTATION						6
Static and Dynamic Characteristics of Measurement - Errors in Measurement – Classification of Transducers –RTD transducer-LVDT-Applications							
UNIT V	MEASURING INSTRUMENTS						6
DVM- Function Generator-DC and AC Measurement Bridges: Wheatstone, Schering's Bridge and Wien bridges							
				L:30	T:0	P: 0	Total: 30 Periods
TEXT BOOKS							
T1	I.J Nagarath and Kothari DP, "Electrical Machines", McGraw-Hill Education (India) Pvt Ltd ,4th Edition, 2010						
T2	A.K.Sawhney, "A Course in Electrical & Electronic Measurements and Instrumentation", Dhanpat Rai and Co, 2004.						
REFERENCES							
R1	Del Toro, "Electrical Engineering Fundamentals" Pearson Education, New Delhi, 2007.						
R2	W.D.Cooper & A.D.Helfrick, "Modern Electronic Instrumentation and Measurement Techniques", 5th Edition, PHI, 2002.						
R3	John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2006.						
R4	Thereja .B.L, "Fundamentals of Electrical Engineering and Electronics", S Chand & Co Ltd, 2008.						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Understand the concepts of DC machines						
CO 2	Analyze the basics of transformer						
CO 3	Recognize the basic concepts in induction motors						
CO 4	Realize the analog and digital measurement techniques and basics of error						
CO 5	Know the basic measurement and the relevance of analog and digital instruments in measurements.						

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3											2		
C02	2	2										2		
C03	2											2		
C04	2											2		
C05	2		2	2								3		

23GET104	TAMILS AND TECHNOLOGY				L	T	P	C
[Common to all B.E. / B. Tech. Courses]					1	0	0	1
UNIT I	WEAVING AND CERAMIC TECHNOLOGY							3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.								
UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY							3
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.								
UNIT III	MANUFACTURING TECHNOLOGY							3
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold-Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.								
UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY							3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.								
UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING							3
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.								
					L:15	T:0	P: 0	Total: 15 Periods
TEXT BOOKS								
1	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).							
2	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).							
3	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).							
4	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies).							
5	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).							
6	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).							
7	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).							
8	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.							

23MEB101	ENGINEERING GRAPHICS			L	T	P	C
[Common to all Circuit Branches] (Use of CAD Software)				1	0	2	2
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To provide a common language for engineers and manufacturers to communicate design ideas, specifications, and requirements. To acquire skills in creating and interpreting 2D and 3D representations of components, assemblies and systems. 							
UNIT I	INTRODUCTION TO COMPUTER AIDED SKETCHING						3+6
Introduction - layout of the software- Selection of Drawing Sheet - Standard tool bar/menu - Navigational tools - Co-ordinate system and reference planes-Commands -Tools							
UNIT II	PROJECTION OF POINTS AND LINES						3+6
Projection of points, Projection of straight lines located in the first quadrant							
UNIT III	PROJECTION AND SECTION OF SOLIDS						3+6
Projections and Sections of Simple Solids - Prisms, Pyramids, Cylinders and Cones							
UNIT IV	ORTHOGRAPHIC PROJECTIONS						3+6
Conversion of Isometric Projection to Orthographic Views							
UNIT V	BUILDING DRAWING						3+6
Drawing of a Plan, Elevation - Electrical wiring and Sectioning of Security room and Residential building (Two bed rooms, kitchen, hall, etc.)							
				L:15	T:0	P: 30	Total: 45 Periods
TEXT BOOKS							
T1	N.D. Bhatt and V.M. Panchal, "Engineering Drawing", Charotar Publishing House, 53rd Edition, 2016						
T2	K. R. Gopalakrishnan, "Engineering Drawing" (Vol.I& II), Subhas Publications,2014						
REFERENCES							
R1	Computer Aided Engineering Drawing- by Dr. M H Annaiah, Dr C N Chandrappa and Dr. B Sudheer Premkumar, Fifth edition, New Age International Publishers (2019)						
R2	CADD Centre, Solid Edge, Reference Guide 14, 2015						
R3	K.V. Natarajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2018).						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Create the projections of a points, straight lines and plane surfaces						
CO 2	Illustrate top view and front view of the solids						
CO 3	Sketch sectioned views and develop area required						
CO 4	Demonstrate about isometric, perspective and orthographic projections						
CO 5	Design simple buildings with detailed plan and sectional elevation						

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	1	2		1							2		
C02	3		1	1							2		2	
C03	3	1	3	1	2	2		1			2			
C04	3	3	3	2							2			
C05	3	2	3	2	3						2		3	

23ECB101	CIRCUIT ANALYSIS AND DEVICES	L	T	P	C
		3	0	2	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To familiarize the basic laws, source transformations, theorems and the methods of analyzing electrical circuits. To acquire knowledge about basic concepts of semiconductor diodes and transistors. 					
UNIT I	MESH AND NODE ANALYSIS OF ELECTRIC CIRCUITS	9+6			
THEORY					
Basic Components of electric Circuits, Charge, current, Voltage and Power, Voltage and Current Sources, Ohms Law, Kirchoff's Current Law, Kirchoff's voltage law, series and Parallel Connected Sources, Resistors in Series and Parallel, voltage and current division, Nodal analysis, Mesh analysis.					
PRACTICAL					
<ul style="list-style-type: none"> Verification of ohm's laws Verifications of KVL & KCL. 					
UNIT II	NETWORK THEOREMS AND SOURCE TRANSFORMATION	9+6			
THEORY					
Network Theorems – Linearity and superposition, Thevenin, Norton, Reciprocity, Maximum power transfer and duality – Source Transformation -Star-delta conversion Problems , Application of network theorems in electronic and electric circuits.					
PRACTICAL					
<ul style="list-style-type: none"> Verifications of Thevenin & Norton theorem. Verification of Superposition Theorem. Verification of maximum power transfer Theorem 					
UNIT III	TRANSIENT AND RESONANCE IN RLC CIRCUITS	9+6			
THEORY					
Basic RL and RC Circuits, The Source- Free RL Circuit, The Source-Free RC Circuit, , Driven RL Circuits, Driven RC Circuits, RLC Circuits, Series Resonance, Parallel Resonance, Quality Factor					
PRACTICAL					
<ul style="list-style-type: none"> Determination of Resonance Frequency of Series & Parallel RLC Circuits. 					
UNIT IV	SEMICONDUCTOR DIODES AND THEIR APPLICATIONS	9+6			
THEORY					
Formation of P-N junction, forward and reverse biased P-N junction - depletion and diffusion capacitances, switching characteristics, V-I characteristics, Zener breakdown, Avalanche breakdown, Zener diode, Rectifiers – Half Wave and Full Wave Rectifier, Zener as regulator, SCR, UJT- structure, operation and V-I characteristics, Clipper, Clamper, Photodiode and LED circuits					
PRACTICAL					
<ul style="list-style-type: none"> Characteristic analysis of PN Junction Diode Characteristic analysis of Half Wave and Full Wave Rectifier 					
UNIT V	TRANSISTORS AND THEIR APPLICATIONS	9+6			
THEORY					
BJT: Principle of transistor action–Current components–Cutoff, active and saturation region– Input and output characteristics–CE, CB, & CC Configurations, Fundamentals of JFETs and the device characteristics – JFET parameters, MOSFET – principle of operation- Depletion and enhancement modes, CMOS device structure, characteristics, Source Follower Circuits					

PRACTICAL					
<ul style="list-style-type: none"> • Characteristic analysis of BJT • Characteristic analysis of JFET devices 					
		L:45	T: 0	P: 30	Total: 75 Periods
TEXT BOOKS					
T1	David A. Bell, "Electronic Devices and Circuits", Oxford Higher Education press, 5 th Edition, 2010.				
T2	Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education / PHI, 2008.				
REFERENCES					
R1	Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12th Edition, 2014. David Bell, "Fundamentals of Electric Circuits", Oxford University press, 7thEdition, 2009.				
R2	Allan H.Robbins, Wilhelm C.Miller, "Circuit Analysis Theory and Practice", Cengage Learning, Fifth Edition, 1st Indian Reprint 2013				
R3	Salivhanan, 'Electron Devices and Circuits', 4th edition, McGraw Hill Education India Private Ltd., 2016				
R4	Sudhakar. A and Shyam Mohan. SP "Circuits and Network Analysis & Synthesis"5th edition, Tata McGraw Hill, 2015.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Recall the basic circuits laws and the basic concepts of circuits				
CO 2	Understand the basic principles of network theorems				
CO 3	Apply the concepts of transient and resonance in RLC Circuits				
CO 4	Analyse the electrical characteristics of diodes and their applications				
CO 5	Analyse the electrical characteristics of Transistors and their applications				

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3										3		1
C02	3	3	2	2							2	3	2	2
C03		2	2	3									2	
C04		3	3								3		3	
C05		3	3								3		3	

23ENP101	PROFESSIONAL COMMUNICATION			L	T	P	C
[Common to All Branches]				0	0	4	2
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To develop students' verbal communication skills, enabling them to engage in clear, confident, and coherent discussions with one or multiple listeners, using effective communicative strategies. To equip students with a thorough understanding of communication principles, enabling them to apply these effectively in a professional workplace environment. 							
UNIT I	LISTENING SKILLS						10
The process of Listening & Barriers of listening, Listening to TED Talks and note taking, – Listening to conversations for specific information, Listening to classroom lectures/ talks/ Documentaries.							
UNIT II	READING						10
Cloze exercises, Picture perception, Reading and paraphrasing, Reading and interpreting.							
UNIT III	PROFESSIONAL WRITING						10
Cover letter & Resume preparation, Email writing – formal & Informal, Content writing - planning-writing- editing and proofreading, Report writing- types of report, report format - Fire Accident & Road Accident.							
UNIT IV	COMMUNICATION & SOFT SKILLS						15
Communication & Barriers of Communication- Verbal & Nonverbal Communication, Time Management, Stress Management, Inter & Intra personal skills, Professional ethics, Basic Etiquettes- Social Etiquette- Telephone Etiquettes- Corporate Etiquette.							
UNIT V	SPEAKING						15
Introduction of self and others, Extempore Speech, Public Speaking, Art of Storytelling- Describing and Narrating, Presentation Skills- preparing PPT and Oral presentation, – Group Discussion – Team building- Mock GD, Interview skills- resume based questions- Competency based question-Mock Interview.							
				L: 0	T: 0	P: 4	Total: 60 Periods
TEXT BOOKS							
T1	Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice, Oxford University Press, New Delhi, 2011.						
T2	Rizvi, Ashraf. M. Effective Technical Communication, Tata McGraw-Hill, New Delhi, 2005.						
REFERENCES							
R1	Muralikrishna, & Sunita Mishra. Communication Skills for Engineers. Pearson, New Delhi. 2011						
R2	Mitra K. Barun, –Effective Technical Communication – A Guide for Scientists and Engineers , Oxford University Press, New Delhi, 2006.						
R3	Leo Jones, Richard Alexander, New International Business English, updated Edition, Cambridge University Press, NY, USA.						
R4	Smith—Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason USA.						
R5	Sharon J. Gerson, Steven M. Gerson, –Technical Writing – Process & Product . 3rd Edition, Pearson Education (Singapore) (P) Ltd., New Delhi.						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Select appropriate listening techniques for both formal and informal contexts						

CO 2	Use reading skills to comprehend ambiguity and complexity, and can articulate their own Interpretations.
CO 3	Demonstrate their writing skills for effective communication in both formal and informal situations
CO 4	Discuss clearly, confidently, comprehensively and communicate with one or many listeners using appropriate communicative strategies
CO 5	Apply the various principles of communication in the workplace environment

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01							1	3	2					
C02							1	3	2					
C03							1	3	3					
C04							3	3	3					
C05							3	3	3					

23PYP101	PHYSICS LABORATORY	L	T	P	C
[Common to All Branches]		0	0	2	1
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To develop the knowledge with an experimental understanding the properties of matter, semiconductors, viscosity and optics. • To build knowledge on the practical oriented skills. 					
BASIC MEASURING INSTRUMENT					
<ol style="list-style-type: none"> 1. Screw Gauge 2. Vernier Caliper 3. Travelling Microscope 4. Spectrometer 					
LIST OF EXPERIMENTS					
<ol style="list-style-type: none"> 1. Determination of wavelength of mercury spectrum – Spectrometer grating. 2. Determination of Young’s modulus of the material – uniform bending. 3. Determination of viscosity of liquid – Poiseuille’s method. 4. (a) Determination of the Wavelength of a Laser (b) Particle size determination using Diode Laser. 5. Determination of the Numerical Aperture and the acceptance angle of an optical fiber. 6. Determination of thickness of a thin wire – Air wedge method. 7. Determination of dispersive power of a prism using spectrometer. 8. Determination of Young’s modulus of the material – non uniform bending. 9. Torsional Pendulum - Determination of rigidity modulus of wire and moment of Inertia of disc. 10. Determination of Band gap of semiconductor material. 					
		L:0	T:0	P: 30	Total: 30 Periods
Experiment Beyond Syllabus : Demonstration of Deflection Magnetometer					
TEXT BOOKS					
T1	Physics Laboratory Manual, Department of Physics, 2019, SNSCT.				
REFERENCES					
R1	R.Jayaraman, V.Umadevi, S.Maruthamuthu, B.Saravanakumar, “Engineering Physics Laboratory Manual”, 2013 Pearson Education India.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Evaluate the young’s modulus and Rigidity Modulus of the given material.				
CO 2	Apply the concept of diffraction, Interference and dispersive power to determine wavelength of the given light sources.				
CO 3	Utilize the knowledge on principles of laser, fiber optics to find out the numerical aperture and particle size of a given materials.				
CO 4	Use the concept of viscosity to determine the viscosity of a given liquids.				
CO 5	Compute the band gap of a given semiconductor.				

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	2						2			2			
C02	3	2						2			2			
C03	3	2						2			2			
C04	3	2						2			2			
C05	3	2						2			2			

23GEP101	WORKSHOP PRACTICES LABORATORY	L	T	P	C
(Common to all B.E / B.Tech)		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To use hand tools and machinery in Carpentry, Welding, Fitting shop and Sheet Metal work. To Employ knowledge on House wiring and Electronics components. 					
LIST OF EXPERIMENTS					
GROUP A (CIVIL & MECHANICAL)					30
CIVIL ENGINEERING					12
<ul style="list-style-type: none"> Study of plumbing tools and Components Preparation of threads in pipes Preparation of single and multi-tap connections for domestic Study of carpentry tools and its applications Preparation of Cross Lap and Dovetail Joints. 					
MECHANICAL ENGINEERING					18
<ul style="list-style-type: none"> Study of different types of Welding and its applications Preparation of Butt, Lap and Tee joints Study of sheet metal and its applications Preparation of Rectangular, Square Trays and Funnel Demonstration of Lathe and Drilling Operations Demonstration of Smithy, Foundry tools and Power Tool Operations Plastic Moulding and Glass Cutting 					
GROUP B (ELECTRICAL AND ELECTRONICS)					30
ELECTRICAL ENGINEERING PRACTICE					18
<ul style="list-style-type: none"> Residential house wiring using switches, fuse, miniature circuit breaker, indicator, Lamp and energy meter Fluorescent lamp wiring Stair-case wiring Measurement of electrical quantities –voltage, current, power & power factor in RL Circuit Measurement of energy using single phase energy meter Measurement of insulation resistance to earth of electrical equipment Measurement of single and three phase voltages Study of Iron Box, Emergency Lamp and Fan 					
ELECTRONICS ENGINEERING PRACTICE					12
<ul style="list-style-type: none"> Study of Electronic components and equipments –Resistor, color coding Measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO Verification of logic gates: AND, OR, Ex-OR and NOT Generation of Clock Signal Soldering practice – Components Devices and Circuits Using general purpose PCB. Characteristics of a PN Junction diode 					
		L: 0	T: 0	P: 60	Total: 60 Periods

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Demonstrate plumbing system and Carpentry for the required applications.
CO 2	Relate the basic machining operations with engineering problems.
CO 3	Apply different types of Welding processes and Sheet metal processes for the Industrial applications.
CO 4	Illustrate Residential House wiring and simple wiring circuits..
CO 5	Employ knowledge on measuring electrical quantities.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	<small>(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)</small>													
	CO-PO Mapping											CO-PSO Mapping		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C01	3	2	2	2	3	3			3	2	3	3	3	
C02	3	2	3	2	2	2			1		2			
C03	3	3	3	2	3	2			3	2	3	3	2	
C04	3	3			1						3	1		
C05	3				1						3		2	

23ECP101	INTERNSHIP - I	L	T	P	C
		-	-	-	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To strengthen the association of students with construction industry. • To create awareness amongst the students in the recent trends of electronics and communication field in industries. 					
<p>Minimum of two weeks in an Industry in the area of Electronics and communication Engineering. The summer internship should give exposure to the practical aspects of the discipline. In addition, the student may also work on a specified task or project which may be assigned to him/her. The outcome of the internship should be presented in the form of a report.</p> <p>The ESE assessment will be based on the following:</p> <ol style="list-style-type: none"> i. The work executed/completed at Industry by student. ii. Presentation on the experience gained. iii. The submission of the internship report. iv. Completion certificate from the industry. 					
					Total: 2 weeks
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Apply appropriate workplace behaviors in a professional setting.				
CO 2	Demonstrate content knowledge appropriate to job assignment.				
CO 3	Exhibit evidence of increased content knowledge gained through practical experience				
CO 4	Develop work habits and attitudes necessary for job success.				
CO 5	Develop communication, interpersonal and other critical skills in the job interview process.				

23CHT103	ENVIRONMENTAL SCIENCE & SUSTAINABILITY	L	T	P	C
(Common to all B.E / B.Tech)		2	0	0	0
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To introduce the basic concepts of environment, ecosystem and biodiversity and to impart knowledge on environmental pollution, renewable and non-renewable resources and causes of degradation. To inculcate and embrace sustainability practices and develop a broad understanding on green materials, concept of carbon credit and changes of environmental management. 					
UNIT I	ENVIRONMENT AND BIODIVERSITY	6			
Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Introduction to biodiversity– Values of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex- situ conservation of biodiversity. Field visit on Biodiversity.					
UNIT II	ENVIRONMENTAL POLLUTION	6			
Environmental Pollution -Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollution. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts.					
UNIT III	RENEWABLE SOURCES OF ENERGY-	6			
Energy management and conservation, New Energy Sources: Need of new sources. Solar energy, Wind energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy. Case study on Present Energy resources in India and its sustainability.					
UNIT IV	SUSTAINABILITY PRACTICES	6			
Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Energy Cycles carbon cycle, emission and Sequestration, Sustainable urbanization and technological change.					
UNIT V	SUSTAINABILITY AND MANAGEMENT	6			
Development, GDP, Sustainability - concept, needs and challenges-economic and social aspects of sustainability - millennium development goals and protocols Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry- A case study.					
		L:30	T:0	P: 0	Total: 30 Periods
TEXT BOOKS					
T1	Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.				
T2	Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi,2016.				
REFERENCES					
R1	G.Tyler Miller, "Environmental Science" Cengage Learning India Pvt.Ltd.New Delhi.2011				
R2	R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38 . Edition 2010.				
R3	Gilbert M. Masters and Wendell. P.Ela, "Introduction to EnvironmentalEngineering and Science" PHI Learning Pvt. Ltd. New Delhi.2010.				
R4	Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.				
R5	Erach Bharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient Blackswan Pvt. Ltd. 2013.				

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Understand the ecological balance and preservation of bio diversity.
CO 2	Know the role of human in prevention of pollution and making a clean environment.
CO 3	Explore the environmental impact of various energy resources and also get knowledge about conservation of non-conventional energy resources.
CO 4	Recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
CO 5	Demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	2				2	1				2			
C02	3	3	1			3	1				2			
C03	3	3	1			2					2			
C04	3	3	1	1		2	2				2			
C05	3	3	1	1		2	2				2			

SEMESTER III

23MAT201	PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORMS	L	T	P	C
[Common to AEROSPACE,AGRI,AUTO,BME,CIVIL,ECE,EEE,FT,MECH,MCT]		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To acquaint the students with Differential Equations which are significantly used in engineering problems. • To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems. 					
UNIT I	PARTIAL DIFFERENTIAL EQUATIONS	9			
Formation of partial differential equations – Solutions of standard types of first order partial differential equations – Lagrange’s linear equation – Linear partial differential equations of second order with constant coefficients of homogeneous types – Applications.					
UNIT II	FOURIER SERIES	9			
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range sine series and cosine series – Root mean square value – Parseval’s identity – Harmonic analysis.					
UNIT III	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS	9			
Classification of PDE – Fourier series solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (Cartesian coordinates only).					
UNIT IV	FOURIER TRANSFORMS	9			
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval’s identity.					
UNIT V	Z - TRANSFORMS AND DIFFERENCE EQUATIONS	9			
Z-transforms – Elementary properties – Initial and final value theorems – Inverse Z-transform using partial fraction and convolution theorem – Formation of difference equations – Solution of difference equations using Z - transforms.					
		L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS					
T1	Kreyszig.E, Advanced Engineering Mathematics, John Wiley and Sons, 10th Edition, New Delhi 2016.				
T2	Grewal.B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44th Edition, 2018.				
REFERENCES					
R1	Bali. N.P, Goyal. M. and Watkins. C., Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.				
R2	James. G., "Advanced Modern Engineering Mathematics", 4th Edition, Pearson Education, New Delhi, 2016.				
R3	Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2018.				
R4	Wylie. R.C. and Barrett . L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.				
R5	Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999.				

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Discuss partial differential equations and solve certain types of partial differential equations.
CO 2	Demonstrate differential equations using Fourier series analysis which plays a vital role in Engineering applications.
CO 3	Utilize the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
CO 4	Analyze the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some physical problems of engineering.
CO 5	Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PSO1	PSO2	PSO3
C01	3	3			2			2			2			
C02	3	3			2			2			2			
C03	3	3			2			2			2			
C04	3	3			2			2			2			
C05	3	3			2			2			2			

23ECT201	ELECTRONIC CIRCUITS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To learn the biasing circuits for BJT and FET amplifiers. To impart knowledge on the concepts of oscillators, multivibrators and power amplifiers. 							
UNIT I	BJT AND FET BIASING						9
Operating point, Bias stability, Fixed bias configuration, Collector-to- Base bias configuration, Voltage divider bias configuration, Bias compensation, Biasing the FET, Fixed Bias configuration, Self-Bias configuration, Voltage –divider bias configuration.							
UNIT II	BJT AND FET AMPLIFIERS						9
Two port devices and network parameters (Z,Y,h parameters), Transistor Hybrid model, Analysis of transistor amplifier circuit using h-Parameters, Simplified CE hybrid model, Single stage amplifiers-Common Emitter amplifier, Common Collector amplifier, Common Base amplifier. Small signal analysis of CE amplifier with voltage divider bias, FET Amplifiers-Small signal analysis of CS amplifier with fixed bias, Multistage amplifiers-Cascade and Cascode amplifier , Darlington amplifier and its applications.							
UNIT III	TUNED AMPLIFIERS & FEEDBACK AMPLIFIERS						9
Tuned amplifiers, Single Tuned amplifiers, Double tuned amplifiers. (Quality factor & Response of tuned amplifier), Basic concept of Feedback, effects of negative feedback, Types of Negative feedback (Voltage-series feedback, Voltage-shunt feedback, Current-series feedback, Current-shunt feedback)							
UNIT IV	OSCILLATORS& WAVEFORM GENERATORS						9
Condition for oscillation, Hartley Oscillator, Colpitts Oscillator, RC Phase shift Oscillator, Wien Bridge oscillator, Crystal oscillator, Wave shaping circuits, Multivibrators-Astable multivibrator, Monostable multivibrator and Bistable multivibrator.							
UNIT V	POWER AMPLIFIERS AND APPICATIONS						9
Difference between Voltage amplifier and Power amplifiers, Classification of Power amplifiers, Class A amplifiers, Class B amplifiers, Class AB amplifiers, Class C and D amplifiers, Applications of Power amplifiers, Audio amplifiers, RF applications.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Sedra and Smith, “Micro Electronic Circuits”; Sixth Edition, Oxford University Press, 2011.						
T2	Robert L Boylestad, Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson 11 th Edition, 2015.						
REFERENCES							
R1	David A Bell , “Electronic Devices and Circuits”, Oxford University Press, 5th Edition, 2008.						
R2	B.L. Theraja, A.K. Theraja, “A Text Book of Electrical Technology, Electronic Devices and Circuits”, S. Chand Reprint, 2013.						
R3	Millman.J. and Halkias C.C, “Integrated Electronics”, McGraw Hill, 2001.						
R4	Anil K. Maini,VashaAgarval, “ Electronic Devices and Circuits”, Wiley 1st Edition, 2009.						
R5	Thomas L Floyd , “Fundamentals of Analog Circuits”, Pearson 2nd Edition, 2012.						
COURSE OUTCOMES							
At the end of the course students should be able to							

CO 1	understand the design of biasing circuits for BJT/FET amplifiers.
CO 2	analyze the small signal model of amplifiers.
CO 3	apply negative feedbacks in the design of amplifiers.
CO 4	familiarize the fundamentals of oscillators and multivibrators.
CO 5	discuss the need for Power amplifiers.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3											3		
C02		3	3	2	2							3		
C03		2	3	3	3							3	2	
C04	3										3		3	3
C05	2			3	2						3		3	3

23ECT202	SIGNALS AND SYSTEMS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To understand the basic properties of signal & systems. To analyze continuous time and discrete time signals and systems. 							
UNIT I	CLASSIFICATION OF SIGNALS AND SYSTEMS						9
Continuous time signals (CT signals), Discrete time signals (DT signals) - Step, Ramp, Impulse, Exponential & Sinusoidal. Classification of CT and DT signals - Periodic and Aperiodic Signals, Energy and Power signals, Symmetric and Antisymmetric signals, Classification of CT systems and DT systems.							
UNIT II	ANALYSIS OF CONTINUOUS TIME SIGNALS						9
Review of Fourier series, Fourier Transform - Properties, Laplace Transform in Signal Analysis - Region of convergence (ROC) of Laplace transform-Hilbert Transform.							
UNIT III	LINEAR TIME INVARIANT - CONTINUOUS TIME SYSTEMS						9
Convolution Integral, Impulse response, Frequency response, Differential equation - LTI system analysis using Fourier and Laplace transforms - Block diagram representation.							
UNIT IV	ANALYSIS OF DISCRETE TIME SIGNALS						9
DTFT, Z - transform, Properties of Z transform, Inverse Z transforms using Power series expansion and Partial fraction expansion.							
UNIT V	LINEAR TIME INVARIANT - DISCRETE TIME SYSTEMS						9
Impulse response, Difference equations - LTI system analysis using Z-transform, Convolution Sum, Block diagram representation.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Oppenheim, Willsky and Hamid, "Signals and Systems", 2nd Edition, Pearson Education, New Delhi, 2015.						
T2	Simon Haykin, Barry Van Veen, "Signals and Systems", 2nd Edition, Wiley, 2002						
REFERENCES							
R1	B.P. Lathi, "Principles of Linear Systems and Signals", 2nd Edition, Oxford, 2009.						
R2	M. J. Roberts, "Signals and Systems Analysis using Transform methods and MATLAB", McGraw- Hill Education, 2018.						
R3	John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007.						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Classify signals and systems in continuous time and discrete time.						
CO 2	Compute various transforms.						
CO 3	Analyze the continuous time LTI systems using Fourier and Laplace transform.						
CO 4	Apply Z transform in discrete time signal analysis.						
CO 5	Evaluate the discrete time LTI systems using Z transform.						

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	2	1								1	2		
C02	2	1		2		2								
C03	2	3	2	2	1						2	3	3	2
C04	3	2	3							2	3		2	3
C05	2	3	3	3	2					2	2		3	2

23CST205	Object Oriented Programming Using Java			L	T	P	C
[Common to ECE, EEE, BME]				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To understand the basic concepts and fundamentals of platform independent object-oriented language. Able to solve real world problems using OOP techniques. 							
UNIT I	INTRODUCTION TO OOP						9
Object Oriented Programming concepts–Objects–Classes–Inheritance– polymorphism – Abstraction- Encapsulation, Features of Java, Byte code and Java Virtual Machine, JDK							
UNIT II	INTRODUCTION TO JAVA						9
Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.							
UNIT III	OBJECTS AND CLASS						9
Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, String Buffer, File, this reference.							
UNIT IV	INHERITANCE AND POLYMORPHISM						9
Inheritance- Super class - Sub class - protected members - constructors in sub class – Overriding – Abstract class-Final methods and classes, Interfaces, Packages.							
UNIT V	MULTITHREADING IN JAVA						9
Multithreading - Thread life cycle and methods, Thread Creation, Thread synchronization, Inter-thread communication, Exception handling with try-catch-finally							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Herbert Schildt, “Java: The Complete Reference”, 11 th Edition, McGraw Hill Education, New Delhi, 2019.						
REFERENCES							
R1	Cay S. Horstmann, “Core Java Fundamentals”, Volume 1, 11 th Edition, Prentice Hall, 2018.						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Understand the basic concepts of OOP						
CO 2	Adapt control structures and looping in solving problems						
CO 3	Apply the concepts of classes and objects in real time applications						
CO 4	Develop programs using inheritance, packages and interfaces						
CO 5	Make use of exception handling mechanisms and multithreaded model to solve real world problems						

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	1	2		2								2	1	
C02	1	1		2	1							1	2	
C03	1	2		1		2						1	2	
C04	2		2				2			1		2		3
C05			2	2		2				1				2

23GET275	VQAR-I			L	T	P	C
[Common to All B.E. / B. Tech. Courses]				2	0	0	2
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To understand quantitative aptitude for financial applications & analytical and logical reasoning skills in verbal ability. To grasp fundamental grammar and comprehension skills for effective communication. 							
UNIT I	QUANTITATIVE ABILITY I						8
Number theory- Shortcuts, Divisibility rule- Unit place deduction-LCM &HCF, Square root and Cube Root, Decimal & Fraction Percentage, Profit, loss and discount, Simple and compound interest, Ratio & Proportions, Mixtures & Allegation, Partnership.							
UNIT II	QUANTITATIVE ABILITY II						6
Problems on Ages, Average, Clocks, Calendar & Data Interpretation- Bar chart- Pie chart- Line chart- Tables chart.							
UNIT III	VERBAL REASONING I						7
Analytical reasoning- Linear and circular arrangement, Blood relation, Direction Problems, Puzzles. Logical reasoning - Number and Alpha series, Odd man out, Element series and Logical series, Coding and decoding, Analogy, Classification, Logical sequence of words.							
UNIT IV	LINGUISTICS SKILLS I						6
Parts of Speech- Noun, Verb, Participle, Articles, Pronoun, Preposition, Adverb, Conjunction. Logical Sequence of words, Tense & Voice, Comparison.							
UNIT V	LINGUISTICS SKILLS II						3
Comprehension - Comprehend and understand a paragraph, Paragraph writing.							
				L:30	T:0	P: 0	Total: 30 Periods
TEXT BOOKS							
T1	Rajesh Varma, "Fast Track Objective Arithmetic", Arihant Publications.						
T2	M. K. Panday, "Analytical Reasoning", Magical Series.						
REFERENCES							
R1	R.V.Praveen, "Quantitative Aptitude and Reasoning" PHI Publication.						
R2	R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand & Company Pvt Limited.						
R3	R.S.Agarwal, "A modern approach to Verbal & Non-verbal reasoning", S.Chand & Company Pvt Limited.						
R4	John Eastwood, "Oxford Practice Grammar", Oxford.						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Apply the number system for solving application-orientated concepts in quantitative aptitude.						
CO 2	Apply the financial ability for solving application-orientated concepts in quantitative aptitude and in the data interpretation techniques.						
CO 3	Analyze the analytical reasoning and logical reasoning in verbal aptitude applications.						
CO 4	Apply appropriate grammar in both speaking and writing.						
CO 5	Analyze the given content and write a creative content.						

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3			2									
C02	3			3						3				
C03		3	2						3					
C04							2	2	3					
C05			3						3		3			

23ECB201	DIGITAL SYSTEMS DESIGN	L	T	P	C
		3	0	2	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To gain knowledge on basic theorems and minimization of Boolean expressions. To design various combinational and sequential circuits. 					
UNIT I	BOOLEAN THEOREMS AND LOGIC REDUCTION	9+6			
THEORY					
Number systems - Basic Theorems and Properties of Boolean Algebra - Minimization of Boolean expressions- Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization, completely and incompletely specified functions Quine- Mc Cluskey method, Logic Gates, Implementation of Boolean expressions using universal gates.					
PRACTICAL					
<ul style="list-style-type: none"> Verification of Logic Gates. Design and implementation of Boolean logic functions using universal gates. Implementation of binary adder and subtractor using logic gates. 					
UNIT II	COMBINATIONAL CIRCUITS	9+6			
THEORY					
Design procedure –Adder –Subtractor – Multiplexer - Demultiplexer – decoder - encoder – code converters: Binary to Gray, Gray to binary, BCD to Excess 3, Excess 3 to BCD – Magnitude Comparator - Parity Generator/Checker. Case study: Digital trans-receiver / 8 bit Arithmetic and logic unit, Seven Segment display decoder					
PRACTICAL					
<ul style="list-style-type: none"> Design and implementation of code converters using logic gates. Design and implementation of multiplexer/demultiplexer using logic gates. Design and implementation of Parity Generator/Checker using logic gates. 					
UNIT III	SEQUENTIAL CIRCUITS	9+6			
THEORY					
Latches – Fundamentals of SR, JK, T, D and Master/Slave FF: Operation and excitation tables, Analysis and design of clocked sequential circuits –Finite State Machines - Moore/Mealy models, state minimization, state assignment. Hazards, Essential Hazards, Design of Hazard free circuits.					
PRACTICAL					
<ul style="list-style-type: none"> Implementation of T flip-flop using JK flip-flop Implementation of JK flip-flop using SR flip-flop 					
UNIT IV	SHIFT REGISTERS AND COUNTERS	9+6			
THEORY					
Registers: Shift registers – SISO,SIPO,PISO,PIPO, Universal shift register. Counters: Ripple counters - Synchronous counters - up/down counter - Modulo-n counter- Decade counters - Ring counters.					
PRACTICAL					
<ul style="list-style-type: none"> Implementation of shift registers using Flip- flops. Design and implementation of synchronous counter. Design and implementation of Ring counter. 					
UNIT V	PROGRAMMABLE LOGIC DEVICES AND DIGITAL LOGIC FAMILIES	9+6			

THEORY			
Programmable Logic Devices: PROM, Programmable Logic Array (PLA), Programmable Array Logic (PAL), Implementation of combinational logic using PROM, PLA and PAL Digital logic families: TTL, ECL and CMOS - Implementation of combinational circuits using Verilog Hardware Description Language.			
PRACTICAL			
<ul style="list-style-type: none"> Simulation of adder/subtractor using Verilog Hardware Description Language. Simulation of shift register using Verilog Hardware Description Language. 			
L:45		T: 0	P: 30
Total: 75 Periods			
TEXT BOOKS			
T1	M. Morris Mano and Michael D. Ciletti, "Digital Design", 6th Edition, Pearson, 2018.		
T2	Thomas L. Floyd, Digital Fundamentals, Prentice Hall, 11th Edition, 2017		
REFERENCES			
R1	Charles H. Roth, Jr., Fundamentals of Logic Design, 2014, 7th Edition Reprint, Brooks/Cole, Pacific Grove, US.		
R2	Roger Tokheim and Patrick Hoppe, "Digital Electronics: Principles and Applications", 9th Edition, Mc Graw Hill publications, 2022.		
R3	A. Anand Kumar, "Fundamentals of Digital Circuits", 4th Edition, PHI Learning Private Limited, 2016.		
COURSE OUTCOMES			
At the end of the course students should be able to			
CO 1	Understand Boolean algebra and simplification procedures relevant to digital logic.		
CO 2	Implement various combinational circuits using logic gates		
CO 3	Design various sequential circuits.		
CO 4	Analyse and design shift registers and counters		
CO 5	Build combinational circuits using programmable logic devices and VHDL.		

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3													
CO2	2	3	2								2	3		3
CO3	2	2	2	2							2	2		2
CO4	2	2	2	2							3	3	2	2
CO5	2	3	2								2	2	2	2

23ECP201	ELECTRONIC CIRCUITS LABORATORY	L	T	P	C
		0	0	3	1.5
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To demonstrate the frequency response of BJT, FET and feedback amplifiers. To demonstrate various oscillators and multivibrators. 					
LIST OF EXPERIMENTS					
Design and analysis of the following circuits: <ol style="list-style-type: none"> Frequency response of common emitter amplifier with voltage divider bias Frequency response of current series feedback amplifiers RC phase shift oscillator Hartley oscillator Colpitts oscillator Single tuned amplifier Astable multivibrator Monostable multivibrator Simulation using SPICE (Using Transistor): <ol style="list-style-type: none"> Frequency response of common source FET amplifier with voltage divider bias Frequency response of voltage series feedback amplifier Wien Bridge oscillator Frequency response of Class A power amplifier 					
MAJOR EQUIPMENTS / SOFTWARE REQUIRED					
Hardware					
<ul style="list-style-type: none"> Function Generator CRO Variable DC power supply 					
Software					
SPICE					
		L:0	T:0	P: 45	Total: 45 Periods
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Design and analyze the transistor amplifier circuits				
CO 2	Design and analyze the feedback amplifiers				
CO 3	Design oscillators and tuned amplifiers				
CO 4	Design multivibrator circuits				
CO 5	Design and simulate feedback amplifiers, oscillators and power amplifiers using SPICE				

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3	3	3								3		
C02	3	3	3	3								3		
C03	3	3	3	2								3	2	
C04	3	2	3	2							3	3	3	3
C05					3						3	3	3	3

23CSP205	Object-Oriented Programming Using Java Laboratory	L	T	P	C
[Common to ECE, EEE, BME]		0	0	3	1.5
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To acquire the basic knowledge and skills necessary to implement object-oriented programming techniques in software development using Java. 					
LIST OF EXPERIMENTS					
<ol style="list-style-type: none"> Solving programs with I/O Statements Solving programs using Data types, variables, and Operators Solving problems using Control structures Solving problems using arrays Programs using classes, methods, and objects using overloading Programs using class and constructors Programs employing inheritance Programs employing Polymorphism Programs employing Abstract Class Solving problems using the concept of Exception Handling Solving problems using the concept of Multithreading 					
HARDWARE/SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS					
Hardware					
<ul style="list-style-type: none"> LAN System with 33 nodes (OR) Standalone PCs-33 Nos. Printers- 3 Nos. 					
Software					
<ul style="list-style-type: none"> Java/J2SE Compiler, NetBeans 					
		L:0	T:0	P: 45	Total: 45 Periods
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Solves problems using datatypes, variables, and operators in Java.				
CO 2	Discover the use of control structures and Looping using classes and methods				
CO 3	Infer the use of constructors in solving real-time applications				
CO 4	Apply the concepts of inheritance, polymorphism, and packages to solve real-world problems				
CO 5	Develop applications using the concept of threads and exceptions				

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01		2		2								2	1	
C02		1		2	1							2	2	
C03	1	2		1		1						3	2	
C04	2		2				1			1		2		3
C05				2		1				1				2

23GEP275	PERSONAL BRANDING (PRACTICAL)	L	T	P	C
[Common to All B.E. / B. Tech. Courses]		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To understand personality self-development, body language, and social imaging qualities for professional grooming and effective interviews. To develop interview, leadership, and personal branding skills for self-assessment and career advancement. 					
UNIT I	SELF-AWARENESS & PERSONAL DEVELOPMENT				
Self-Awareness: Key Areas -Personality, Values, Habits, Needs & Emotions, Impact of Self-Awareness on Personal Development Personality –Definition, Elements, Determinants, Needs and Benefits, Personality traits. Personality development skills, Positive traits for effective people, SWOT :Analyzing Strength and weakness (SWOT), Building Esteem & Self-Confidence, Working on attitudes (aggressive, assertive, submissive), Self-Motivation					
UNIT II	BODY LANGUAGE				
Body Language and Gestures, Personal Grooming, Personal Hygiene, Social Effectiveness, Business Etiquette					
UNIT III	INTERVIEW AND LEADERSHIP SKILLS				
Resume Building, Video Resume, Leadership Styles, Leadership Traits, Group Dynamics- Conflict management					
UNIT IV	SOCIAL IMAGE TRAITS				
Social etiquettes -Positive Social Image, Social Graces, Online Etiquettes, Dining Etiquettes, Voice Modulation, – Networking: Case Study and Company website references.					
UNIT V	PERSONALITY TEST				
Big Five Personality Test, Open DISC Assessment Test					
LIST OF EXERCISES					
<ol style="list-style-type: none"> SWOT Analysis Grooming, Dressing and Photo-shoot Body Language, Handshaking Art of Storytelling, Marketing & selling yourself Self-Discipline: Goal setting (Qualitative and Quantitative) Teamwork & Leadership Activity Dealing with Pressure, Failure & Decision Making Psychological/Personality test Video Resume Business Card creation Social Profiling in FB/Insta/Linked In/Personal Website Online Interview Speed Interview Networking Event-Online/Offline 					
		L:0	T:0	P: 60	Total: 60 Periods
TEXT BOOKS					
T1	Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw				

	Hill.
T2	Stephen P. Robbins and Timothy A. Judge (2014), Organizational Behavior 16th Edition: Prentice Hall.
REFERENCES	
R1	Smith, B. Body Language. Delhi: Rohan Book Company. 2004
R2	Personality Development and Career management: By R.M.Onkar (S Chand Publications)
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Evaluate the quality of personality for self-development in a career perspective.
CO 2	Apply the body language in his professional interview modes.
CO 3	Apply the communication and leadership styles in public speaking.
CO 4	Apply the social imaging qualities in their presentation skill.
CO 5	Demonstrate personality skills in mock interviews.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01								3			3			
C02							3	3	3					
C03			2					3	3					
C04				2					3		2			
C05								3	3					

23ECP202	MINI PROJECT -I	L	T	P	C
		0	0	2	1
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To help students apply their theoretical knowledge to real-world problems • To develop interactive, communication, organization, time management, and presentation skills. 					
<ol style="list-style-type: none"> 1. The mini-project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design. 2. The students must follow up design thinking process to carry out mini project. 3. The project should be a complete hardware or a combination of hardware and software. The software part in mini project should be less than 50% of the total work. 4. Mini Project should cater to a small system required in laboratory or real life. 5. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced. 6. After interactions with course coordinator and based on comprehensive literature survey, the student shall identify the title and define the aim and objectives of mini-project. 7. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester. 8. The student is expected to exert on design, development and testing of the proposed work as per the schedule. 9. Art work and Layout should be made using CAD based PCB simulation software. 10. Completed mini project and project report is to be submitted at the end of semester. 11. End semester marks for the mini-project shall be awarded based on the evaluation of Innovative project idea, Presentation skill, Mini-Project Report and viva voce by the external examiners appointed by the COE. 					
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Identify Engineering problem relevant to the domain interest.				
CO 2	Carry out literature survey for its worthiness.				
CO 3	Analyze and identify a appropriate technique to solve the problem				
CO 4	Perform experimentation, simulation, programming, fabrication, collect and interpret data.				
CO 5	Demonstrate their responsibility as a member and a leader in a team to manage projects.				

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	2										3		
C02		3	3				2					2		
C03			3			2		2			2		3	
C04				3	3	2		3	2		2		2	2
C05								3	2	3	1			2

SEMESTER IV

23MAT203	PROBABILITY AND RANDOM PROCESSES	L	T	P	C
[Common to ECE]		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To understand the concepts of probability, random variables that are applicable to engineering which can describe real life phenomenon. • To provide necessary basics in probability and random processes that are relevant in applications such as random signals, linear systems in communication engineering. 					
UNIT I	PROBABILITY AND RANDOM VARIABLES	9			
Axioms of probability - Conditional probability - Total probability - Baye's theorem- Discrete and continuous random variables – Moments – Moment generating functions and their properties.					
UNIT II	TWO DIMENSIONAL RANDOM VARIABLES	9			
Joint distributions –Marginal and conditional distributions – Covariance – Correlation and Regression.					
UNIT III	CLASSIFICATION OF RANDOM PROCESSES	9			
Classification – Stationary Process - Wide-sense stationary processes - Markov process – Markov Chain.					
UNIT IV	CORRELATION AND SPECTRAL DENSITIES	9			
Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density – Properties-Wiener-Khintchine relation.					
UNIT V	LINEAR SYSTEMS WITH RANDOM INPUTS	9			
Linear time invariant system- System transfer function –Linear system with random inputs –Auto correlation and Cross correlation functions of input and output.					
L:45		T:0	P: 0	Total: 45 Periods	
TEXT BOOKS					
T1	Oliver C. Ibe, "Fundamentals of Applied probability and Random processes", Elsevier, First Indian Reprint (2014).				
T2	Peebles Jr. P.Z., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill Publishers, Fourth Edition, New Delhi, 2002.				
REFERENCES					
R1	Cooper. G.R.and McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.				
R2	Yates. R.D. and Goodman.D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.				
R3	Leon-Garcia, A, "Probability and Random Processes for Electrical Engineering", Pearson Education Asia, Second Edition, 2007.				
R4	Scott Miller and Donald Childers, "Probability and Random Processes", 2nd Edition, Elsevier, 2012.				
R5	Herry Sark and John Woods, "Probability Statistics and Random Processes for Engineers", 4th Edition, Pearson, 2012.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Revise fundamental knowledge of the concepts of probability distributions which can describe real life phenomenon.				

CO 2	Apply the basic concepts of one and two dimensional random variables in engineering.
CO 3	Demonstrate the purpose of some special processes.
CO 4	Evaluate the power spectral density and cross spectral density by using auto correlation and cross correlation of a random process.
CO 5	Analyze linear time invariant systems performance for random inputs.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3						2			2			
C02	3	3						2			2			
C03	3	3						2			3			
C04	3	3						2			3			
C05	3	3						2			3			

23ECT203	DIGITAL SIGNAL PROCESSING			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To understand Discrete Fourier transform, Fast Fourier transform and its applications. Design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands To analyze the fundamental concepts of multi rate signal processing, adaptive filters and its applications. 							
UNIT I	DISCRETE FOURIER TRANSFORM						9
Review of Discrete Signals and Systems- Introduction to DFT – Properties of DFT – Linear and Circular Convolution – Auto correlation and Cross Correlation - FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms – Overlap-add & Overlap-save methods.							
UNIT II	IIR FILTER DESIGN						9
Analog filters – Butterworth filter, Chebyshev filter, Analog Transformation of prototype LPF to HPF/BPF/ BSF, Impulse invariant method and Bilinear transformation method - Realization structures for IIR filters – Direct Form I, Direct Form II, Cascade and Parallel Form.							
UNIT III	FIR FILTER DESIGN						9
Design of Linear Phase FIR filter - Filter design using Rectangular Window, Hamming Window, Hanning Window, Blackman window - Frequency Sampling Techniques, Realization Structures for FIR filters - Comparison of FIR & IIR.							
UNIT IV	FINITE WORDLENGTH EFFECTS						9
Fixed and Floating Point Representation - Quantization - Coefficient Quantization error - Product Quantization error - Truncation & Rounding errors - Limit cycle due to product round-off error - Limit cycle oscillation due to overflow in digital filters - Principle of Scaling - DSP Processor - Fixed and Floating point architecture principles.							
UNIT V	DSP APPLICATIONS						9
Multirate Signal Processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Applications of Multirate signal processing - Introduction to Wavelets- Applications. Adaptive Filters: Introduction, Types of adaptive filters, Applications of adaptive filtering to equalization.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	John G Proakis and D G Manolakis, “Digital Signal Processing Principles, Algorithms and Applications”, Pearson Education, Fifth Edition, 2022.						
T2	A.V.Oppenheim, R.W. Schafer & J.R. Buck, "Discrete Time Signal Processing", 4th Edition, Pearson Education, 2011.						
REFERENCES							
R1	Steven W.Smith, “Digital Signal Processing: A Practical Guide for Engineers and Scientists”, Kindle Edition, Newnes, 2013.						
R2	E.C. Ifeachor and B.W. Jervis, “Digital signal processing - A practical approach”, Second edition, Pearson Education, 2002.						
R3	M.H.Hayes, "Digital Signal Processing", Tata McGraw Hill Education, 2nd Edition, 2009.						
R4	S.Salivahanan, A.Vallavaraj, C.Gnanapriya, Digital Signal processing, Tata McGraw Hill, 4th Edition, 2019.						
R5	S.K. Mitra, " Digital Signal Processing", A Computer Based approach, Tata McGraw-Hill, 4th						

	Edition, 2013.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Understand and analyze the signal using Fourier transform.
CO 2	Design digital IIR filters using various techniques.
CO 3	Construct the digital FIR filters by windowing method.
CO 4	Analyze the performance degradation of digital signal processing systems due to finite precision.
CO 5	Evaluate the applications of multirate digital signal processing.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3	3		2							2		1
C02	2	3	2	2	2					2		3		
C03	2	3	2	2	2					2		3		
C04		2	1	3										3
C05	1					3			2				3	

23ECT204	LINEAR CONTROL SYSTEMS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To analyze the various types of systems in time and frequency domain. To understand the stability analysis of frequency domain systems. To apply state variable analysis to both continuous and discrete time systems. 							
UNIT I	CONTROL SYSTEM MODELING						9
Basic Elements of Control System - Open loop and Closed loop systems - Transfer function Rules of Block diagram Algebra -Block Diagram reduction Techniques -Mason's Gain Formula, Construction of signal flow graphs.							
UNIT II	TIME RESPONSE ANALYSIS						9
Time response analysis - Impulse and Step Response analysis of First order and Second order systems - Steady state errors - P, PI, PD and PID Compensation.							
UNIT III	FREQUENCY RESPONSE ANALYSIS						9
Frequency Response - Bode Plot, Polar Plot, Nyquist Plot Frequency Domain specifications from the plots. Series- Parallel Compensators - Lead, Lag, and Lead Lag Compensators.							
UNIT IV	STABILITY ANALYSIS						9
Concepts of stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Dominant Poles, Nyquist Stability Criterion.							
UNIT V	STATE VARIABLE ANALYSIS						9
Concepts of State, State variables and State model - State Models for Linear Continuous time systems -State Variables and Linear Discrete Time Systems - Concepts of Controllability and Observability.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 7th Edition, 2021.						
T2	M.Gopal, "Control System - Principles and Design", Tata McGraw Hill, 4th Edition, 2012.						
REFERENCES							
R1	Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 9th Edition,2007.Schaum's Outline Series, "Feedback and Control Systems" Tata McGraw-Hill, 2007.						
R2	John J.D Azzo&H.Houpis, "Linear Control System Analysis and Design", Tata McGraw-Hill, 2011.						
R3	Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Addison, 12th Edition, 2009.						
R4	Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India,3rd edition, 2013.						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Understand the Fundamental Concepts of Control Systems.						
CO 2	Perform the time domain analysis of control systems required for stability analysis.						
CO 3	Characterize the frequency domain analysis of control systems for stability analysis.						
CO 4	Determine and analyze the stability of the system.						

CO 5	Analyze a system's controllability, observability, and stability using the state model.
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COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3		2		2					2	2	2	
C02	2	2										3	2	
C03		3	2	2	2								2	
C04		2	2	2	2							2	2	
C05		3	3	2	2	2					2	2		2

23ECT205	ELECTROMAGNETIC FIELDS AND WAVES			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To impart knowledge on the basics of static electric and magnetic fields and the associated laws. To give insight into coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations. To educate the behaviour of the propagation of EM waves. 							
UNIT I	ELECTROSTATICS						9
Review of vector algebra, Cartesian, cylindrical and spherical coordinates, Gradient, Divergence of a vector and Divergence theorem, Curl of a vector and Stoke's theorem. Coulomb's law, Electric field, Electric fields due to continuous charge distributions, Gauss's law, Electric potential, Relation between electric field and potential.							
UNIT II	ELECTROSTATIC FIELDS IN CONDUCTORS AND DIELECTRICS						9
Conductors in static electric field, Current density and Ohm's law, Continuity Equation, Dielectrics in static electric field, Polarization, Dielectric strength and dielectric constant, Boundary conditions, Poisson's and Laplace's equations, Capacitance, Parallel, cylindrical and spherical capacitors, Energy stored in capacitor.							
UNIT III	MAGNETOSTATICS						9
Magnetic field intensity and flux density, Biot-Savart law, Calculation of magnetic field intensity due to straight and circular conductors, Ampere's Circuit law. Boundary conditions, Inductance and inductors, Magnetic energy, Lorentz's Force equation, Magnetic forces, Scalar and vector magnetic potential.							
UNIT IV	TIME VARYING FIELDS & MAXWELL'S EQUATIONS						9
Faraday's law, Transformer and Motional EMFs, Displacement current, Maxwell's Equation in integral and differential form for steady and time varying fields, Electromagnetic boundary conditions, Power and the Poynting vector, Time-harmonic fields.							
UNIT V	PLANE ELECTROMAGNETIC WAVES						9
Wave equations, Wave Propagation in lossy dielectrics, Plane waves in lossless dielectrics, Plane waves in free space, Plane waves in good conductors, Skin effect, Group velocity, Reflection of a Plane Wave at Normal Incidence.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	E.C. Jordan & G. Balmain, "Electromagnetic Waves and Radiating Systems", Pearson India, 2nd edition, 2015.						
T2	M.N.O.Sadiku and S.V. Kulkarni, "Principles of Electromagnetics", 6th ed., Oxford(Asian Edition), 2015.						
REFERENCES							
R1	K.A. Gangadhar, "Field Theory", 16th Edition, I Reprint, Khanna Publishers, 2008.						
R2	Matthew N.O.Sadiku: "Elements of Engineering Electromagnetics" Oxford University Press, 4th Edition, 2007.						
R3	S.P.Seth, "Elements of Electromagnetic Fields" DhanapatRai publishing company, 3rd edition New Delhi 2009.						
R4	W H Hayt Jr, J A Buck, M Jaleel Akhtar, "Engineering Electromagnetics", McGraw-Hill;						

	Ninth edition, 2020.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	apply vector analysis to solve field quantities in a variety of geometries and coordinate systems.
CO 2	understand ohms law, conductivity and current in conductors, electric fields in dielectrics.
CO 3	explain magnetostatics and basic relations to analyze the effect of magnetic forces.
CO 4	solve electromagnetic problems using maxwell's equations for time varying fields.
CO 5	analyze electromagnetic wave propagation in free space and in different materials.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3											3	2	
C02	2											3	2	
C03	2											2	2	
C04	2	2	2								2	2	3	2
C05	2	3	2								3	2	3	2

23GET276	VQAR-II	L	T	P	C
[Common to All B.E. / B. Tech. Courses]		2	0	0	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To understand time, distance, and counting techniques like permutation and combination for quantitative applications. To develop verbal and non-verbal reasoning skills along with linguistic abilities for effective communication. 					
UNIT I	QUANTITATIVE ABILITY III	6			
Time, speed & distance-Average speed- Relative speed- Train problems- Boats and streams- Races, Chain rule, Time and work -Pipes and cisterns					
UNIT II	QUANTITATIVE ABILITY IV	4			
Permutation & Combination, Probability, Mensuration					
UNIT III	VERBAL REASONING II	7			
Machine Input and Output, Coded Inequalities, syllogisms, Problems on Cubes, Data sufficiency. Critical Reasoning -Statement and Argument, Statement and Assumption, Statement and Conclusion, Cause and effect, Course of action.					
UNIT IV	NON- VERBAL REASONING	5			
Figure series, Odd man out, Mirror Image, Water image, Embedded Image, Cubes and Dices, Insert the Missing Characters, Analytical reasoning.					
UNIT V	LINGUISTICS SKILLS III	8			
Sentences - Simple, Compound, Complex & Mixed sentences, Sentence Rearrangement, Idioms & Phrases, Reading Comprehension at higher level, Word Substitution, Synonyms & Antonyms, Error Spotting.					
		L:30	T:0	P: 0	Total: 30 Periods
TEXT BOOKS					
T1	Rajesh Varma, "Fast Track Objective Arithmetic", Arihant Publications.				
T2	M.K.Panday, "Analytical Reasoning", Magical Series.				
REFERENCES					
R1	BS Sijwali- Indu Sijwali, A New Approach to "Reasoning Verbal, Non-Verbal & Analytical", Arihant Publications.				
R2	S.P.Bakshi, "Objective English" Arihant Publications.				
R3	R.S.Agarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand & Company Pvt Limited.				
R4	R.S.Agarwal, "A modern approach to Verbal & Non-verbal reasoning", S.Chand & Company Pvt Limited.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Apply the time and distance for solving application orientated concepts in quantitative aptitude.				
CO 2	Apply the financial ability for solving application orientated concepts in quantitative aptitude.				
CO 3	Analyze the verbal reasoning and the critical reasoning in quantitative aptitude.				
CO 4	Analyze the non-verbal reasoning in verbal aptitude applications.				
CO 5	Apply appropriate LSRW skills.				

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3		3										
C02	3			2						3				
C03		2	2						2					
C04		3				2			3					
C05							3	2	3					

23ECB202	LINEAR INTEGRATED CIRCUITS	L	T	P	C
		3	0	2	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To learn the characteristics of operational amplifiers and its applications. To impart knowledge on the function of application specific ICs and its application in communication. 					
UNIT I	OPAMP CHARACTERISTICS	9+6			
THEORY					
Introduction of Op-Amp - Internal circuit diagram of IC 741- Open and closed loop configurations, Ideal Op-Amp- Characteristics, DC characteristics, AC characteristics, frequency response of OP-AMP, Slew rate, Frequency Compensation, MOSFET and JFET Operational Amplifiers.					
PRACTICAL					
<ul style="list-style-type: none"> Measurement of OPAMP Parameters (CMRR and Slew Rate) Design of Inverting and non-inverting amplifier using IC 741. 					
UNIT II	APPLICATIONS OF OPERATIONAL AMPLIFIERS	9+6			
THEORY					
Voltage Follower, V-to-I and I-to-V Converters, Adder, Subtractor, Instrumentation amplifier, Integrator, Differentiator, OPAMP using diodes: Precision rectifier, peak detector, clipper and clamper, Active Filters: Low-pass, high-pass and band-pass Filter, Band Reject Filters, Switched Capacitor Filter.					
PRACTICAL					
<ul style="list-style-type: none"> Design of adder and subtractor Design of Integrator and Differentiator Design of active filters-LPF and HPF 					
UNIT III	WAVEFORM GENERATORS AND VOLTAGE REGULATORS	9+6			
THEORY					
Comparator, Schmitt trigger, Sine-wave generators, Multivibrators, Triangular wave generator, IC Voltage regulators: Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator, Low Drop - Out (LDO) Regulators, Timer IC 555 - Astable and Monostable Operations.					
PRACTICAL					
<ul style="list-style-type: none"> Design of Astable /Monostable multivibrator Design a Schmitt Trigger Design a variable DC regulated Power supply using IC 723 					
UNIT IV	ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTER	9+6			
THEORY					
Analog and Digital Data Conversions, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - Over-sampling A/D Converters, Sigma – Delta converters. D/A converter – specifications - weighted resistor type, R-2R Ladder type, switches for D/A converters, high speed sample-and-hold circuits.					
PRACTICAL					
<ul style="list-style-type: none"> Design of R-2R ladder type D-A converter using Op-Amp Design of flash type ADC using OPAMP 					
UNIT V	ANALOG MULTIPLIER AND PLL	9+6			
THEORY					

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, Application of PLL.				
PRACTICAL				
<ul style="list-style-type: none"> PLL Characteristics and its uses as frequency multiplier 				
L:45		T: 0	P: 30	Total: 75 Periods
TEXT BOOKS				
T1	D.Roy Choudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., Sixth Edition, 2021.			
T2	Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 4th Edition, Tata Mc Graw-Hill, 2017.			
REFERENCES				
R1	Fiore, “Op amps & Linear Integrated Circuits Concepts & applications”, Cengage , 2010.			
R2	Floyd, Buchla, “Fundamentals of Analog Circuits”, Pearson, 2013.			
R3	Gray Hurs and Lewis Meyer, “Analysis and Design of Analog Integrated Circuits”,6th Edition, John Wiley & Sons,2024.			
R4	Sedra and Smith, “Microelectronics Circuits”, Oxford Univ. Press, 2004.			
R5	Robert F.Coughlin, Frederick F.Driscoll, “Operational Amplifiers and Linear Integrated Circuits”, Sixth Edition, PHI, 2001.			
COURSE OUTCOMES				
At the end of the course students should be able to				
CO 1	Understand the basic concepts in the design of Electronic Circuits using Linear Integrated Circuits.			
CO 2	Evaluate the applications of Op - amp.			
CO 3	Generate waveforms using Op - amp Circuits and analyze Voltage regulators.			
CO 4	Design ADC and DAC using Op - amp.			
CO 5	Illustrate the function of application specific IC’s such as PLL and its application.			

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3												3	
C02		3		2	2								3	
C03		2	3		3								3	3
C04		3	3									3		3
C05			3	3								3		3

23ECP203	DIGITAL SIGNAL PROCESSING LABORATORY	L	T	P	C
		0	0	2	1
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To understand the sequence generation, Convolution and Correlation in digital signals. To design and implement IIR and FIR filters for specific frequency requirements. To analyze Multirate Filters, Sampling and frequency response of LTI systems. 					
LIST OF EXPERIMENTS					
<ol style="list-style-type: none"> 1. Generation of Sequences (Functional & Random) 2. Generation of Linear and Circular Convolution Sequence. 3. Auto Correlation and Cross Correlation. 4. Spectrum Analysis using DFT. 5. Design of Butterworth Infinite Impulse Response filter. 6. Design of Chebyshev Infinite Impulse Response filter. 7. Design of Finite Impulse Response filter (Rectangular Window & Hamming Window) 8. Design of Finite Impulse Response filter (Hanning Window & Blackman Window) 9. Multirate Filters. 10. Study of architecture of Digital Signal Processor. 11. MAC operations using DSP Processor. 12. Verification of Sampling Theorem. 13. Time and Frequency Response of LTI System. 					
		L:0	T:0	P: 30	Total: 30 Periods
Experiment Beyond Syllabus: Demonstration of Deflection Magnetometer					
TEXT BOOKS					
T1	John G Proakis and D G Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Pearson Education, Fifth Edition, 2022.				
T2	A.V.Oppenheim, R.W. Schafer & J.R. Buck, "Discrete Time Signal Processing", 4th Edition, Pearson Education, 2011.				
REFERENCES					
R1	Steven W.Smith, "Digital Signal Processing: A Practical Guide for Engineers and Scientists", Kindle Edition, Newnes, 2013.				
R2	E.C. Ifeachor and B.W. Jervis, "Digital signal processing - A practical approach", Second edition, Pearson Education, 2002.				
R3	M.H.Hayes, "Digital Signal Processing", Tata McGraw Hill Education, 2nd Edition, 2009.				
R4	S.Salivahanan, A.Vallavaraj, C.Gnanapriya, Digital Signal processing, Tata McGraw Hill, 4th Edition, 2019.				
R5	S.K. Mitra, " Digital Signal Processing", A Computer Based approach, Tata McGraw-Hill, 4th Edition, 2013.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Generate discrete signals and Convolution using MATLAB.				
CO 2	Construct digital IIR filters using various techniques.				
CO 3	Design and Implement FIR filters by windowing method.				
CO 4	Design Multirate Filters.				
CO 5	Demonstrate the abilities towards DSP Processor based Implementation Systems.				

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3	3	3	1	2	-	-	-	2	2	3	3	2
C02	3	3	3	3	2	2	-	-	-	1	2	2	2	2
C03	3	3	3	3	2	2	-	-	-	2	2	1	2	3
C04	3	3	3	2	2	2	-	-	-	1	2	2	1	2
C05	3	2	2	2	3	2	-	-	-	1	2	2	2	1

23ITP204	PROGRAMMING IN PYTHON				L	T	P	C
[Common to All B.E/B.Tech Programme except CSE, IT and AIML]				0	0	4	2	
COURSE OBJECTIVES								
<ul style="list-style-type: none"> To train the student to the basic concepts of python programming language. To develop correct and efficient Python programs to solve problems spanning multiple disciplines. 								
List of Experiments								60
<ol style="list-style-type: none"> Program for various base conversion functions. Programs to demonstrate the usage of operators and conditional statements Programs to demonstrate usage of control structures Program using array operation Programs to demonstrate the usage of String functions Program using classes and functions Program to implement recursive function. Program to implement lambda function. Program on file manipulation Programs to demonstrate the usage of lists, sets, dictionaries and tuples. Program to implement function template. Program to implement class template 								
				L:0	T:0	P: 60	Total: 60 Periods	
COURSE OUTCOMES								
At the end of the course students should be able to								
CO 1	Write simple programs using built-in data types of Python.							
CO 2	Apply the conditional statements and loops for solving problems.							
CO 3	Implement arrays, strings and functions in Python							
CO 4	Identify the commonly used operations involving lists, sets, dictionaries, tuples and file handling in real time applications.							
CO 5	Implement exemplary applications related to templates for solving real time problems.							

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight (Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	3	2	1									
CO2	3	3	2	1	1									
CO3	3	3	2	1	1						1			
CO4	3	3	2	2	1	1					1			
CO5	3	3	2	2	1	1					1			

23ECP204	INTERNSHIP - II			L	T	P	C
				-	-	-	2
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> • To strengthen the association of students with construction industry. • To create awareness amongst the students in the recent trends of electronics and communication field in industries. 							
<p>Minimum of two weeks in an Industry in the area of Electronics and communication Engineering. The summer internship should give exposure to the practical aspects of the discipline. In addition, the student may also work on a specified task or project which may be assigned to him/her. The outcome of the internship should be presented in the form of a report.</p> <p>The ESE assessment will be based on the following:</p> <ol style="list-style-type: none"> i. The work executed/completed at Industry by student. ii. Presentation on the experience gained. iii. The submission of the internship report. iv. Completion certificate from the industry. 							
						Total: 2 weeks	
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Apply appropriate workplace behaviors in a professional setting.						
CO 2	Demonstrate content knowledge appropriate to job assignment.						
CO 3	Exhibit evidence of increased content knowledge gained through practical experience						
CO 4	Develop work habits and attitudes necessary for job success.						
CO 5	Develop communication, interpersonal and other critical skills in the job interview process.						

SEMESTER V

23ECT301	COMMUNICATION SYSTEMS	L	T	P	C	
		3	0	0	3	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> • To gain knowledge on Analog and Digital communication systems. • To introduce the importance of sampling & quantization. 						
UNIT I	ANALOG COMMUNICATION					9
Introduction to Communication Systems: Modulation – Types – Need for Modulation. Theory of Amplitude Modulation – AM, DSB, SSB (Filter Method), VSB, Angle Modulation – FM, PM. Pulse Modulation: PAM, PPM, PWM – TDM and FDM.						
UNIT II	RADIO RECEIVER					9
Introduction to Radio Communication - Performance parameters of Receivers - Receiver types - AM receivers, Tuned radio Frequency Receivers, Super heterodyne receiver – FM receivers – Noise in AM and FM Receivers.						
UNIT III	DIGITAL COMMUNICATION					9
Block diagram of Digital communication, Low pass Sampling, PCM, DPCM,. Quantization- Types, Baseband Transmission: Properties of Line codes- Power Spectral Density of Line codes –ISI- Nyquist criterion for distortion less transmission –Eye pattern – Equalization- Linear equalization, Decision -feedback equalization, Adaptive linear equalizer.						
UNIT IV	DIGITAL MODULATION TECHNIQUES					9
Modulation techniques - Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK)--Phase Shift Keying (PSK) – BPSK – M-ary digital modulation schemes, QPSK, Minimum Shift Keying (MSK) –Quadrature Amplitude Modulation (QAM)– Bandwidth Efficiency.						
UNIT V	INFORMATION THEORY AND ERROR CONTROL CODING					9
Entropy, Source Encoding Theorem - Shannon Fanon Coding - Huffman Coding, Mutual Information - Channel Capacity, Channel Coding Theorem, Error Control Coding - Linear Block Codes – Hamming Codes - Cyclic Codes - Convolution Codes.						
		L:45	T: 0	P: 0	Total: 45 Periods	
TEXT BOOKS						
T1	Simon Haykin and Michael Moher, “Communication Systems,” 5th edition, John Wiley & Sons, 2021.					
T2	B.P.Lathi, “Modern Digital and Analog Communication Systems”, 4th Edition, Oxford University Press, 2017.					
REFERENCES						
R1	Wayner Tomasi, “Electronic Communication System”, 5th Edition, Pearson Education, 2008.					
R2	D.Roody, J.Coolen, “Electronic Communications”, 4th edition, PHI, 2006.					
R3	K. Sam Shanmugam, Analog and Digital Communication, Willey, 2005.					
R4	B.Sklar, “Digital Communications Fundamentals and Applications”, 2nd Edition Pearson Education, 2007.					

R5	Herbert Taub, Donald L Schilling, Goutam Saha, "Principles of Communication Systems", 3rd Edition, McGraw-Hill, 2008.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Understand the analog modulation techniques.
CO 2	Design radio receiver.
CO 3	Learn the principles of digital communication process.
CO 4	Explore the different digital modulation techniques.
CO 5	Familiarize the error correction and detection techniques.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PSO1	PSO2	PSO3
C01	3											3	3	
C02		2	2								2	3	3	
C03	3					2	3				2	3	3	
C04	3	3	2			2	3					3	3	2
C05	3						3				2	3	3	

23ECP301	COMMUNICATION SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To afford in depth awareness on various analog modulation and demodulation techniques. To familiarize effective methods of digital modulation and demodulation techniques. 					
<ol style="list-style-type: none"> AM- Modulator and Demodulator FM - Modulator and Demodulator Pre-Emphasis and De-Emphasis Signal sampling and TDM Pulse Code Modulation and Demodulation Delta Modulation and Demodulation Pulse Amplitude Modulation and Demodulation Pulse Position Modulation and Demodulation Pulse Width Modulation and Demodulation Digital Modulation – ASK, PSK, FSK Simulation of ASK, FSK, and BPSK Generation and Detection Schemes Simulation of DPSK, QPSK and QAM Generation and Detection Schemes Simulation of Linear Block and Cyclic Error Control coding Schemes 					
		L:0	T:0	P: 4	Total: 60 Periods
TEXT BOOKS					
T1	Simon Haykin and Michael Moher, “Communication Systems,” 5th edition, John Wiley & Sons, 2021.				
T2	B.P.Lathi, “Modern Digital and Analog Communication Systems”, 4th Edition, Oxford University Press, 2017.				
REFERENCES					
R1	Wayner Tomasi, Electronic Communication System, 5 th Edition, Pearson Education, 2008.				
R2	D.Roody, J.Coolen, Electronic Communications, 4th edition, PHI, 2006.				
R3	Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005.				
R4	B.Sklar, “Digital Communications Fundamentals and Applications”, 2nd Edition Pearson Education, 2007.				
R5	Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3rd Edition, McGraw-Hill, 2008.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Design AM, FM Modulators for specific applications.				
CO 2	Compute the sampling frequency for digital modulation.				
CO 3	Simulate & validate the various functional modules of Communication system.				
CO 4	Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes.				

CO 5	Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of Communication system.
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COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3										3		2
C02	3	3	2								2	3	2	2
C03	3	2	2								2	3	2	2
C04	3	2	2								2	3	2	
C05	3	2	2			2	3				2	3	2	

23ECT303	VLSI SYSTEM DESIGN			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To make students to learn various types of MOS Transistor and Memories. To learn the Design and Testing of VLSI circuits and Hardware Descriptive Language is incorporate in various applications. 							
UNIT I	MOS TRANSISTOR PRINCIPLE						9
MOS transistor theory-IV characteristics, CV characteristics, Non-ideal IV effects, CMOS inverter-DC characteristics, CMOS fabrication – p-well process, n-well process, twin-tub process, Stick diagram, Layout diagrams, Technology scaling.							
UNIT II	COMBINATIONAL LOGIC CIRCUITS						9
Examples of Combinational Logic Design, Pass transistor Logic, Transmission gates, Pseudo NMOS logic-static and dynamic CMOS design, Domino Logic, Power dissipation, Low power design principles.							
UNIT III	SEQUENTIAL LOGIC CIRCUITS						9
Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Synchronous design, Sense Amplifier, Semiconductor Memories: SRAM, DRAM, non-volatile memories.							
UNIT IV	DESIGN AND TESTING						9
VLSI testing -need for testing, manufacturing test principles, design strategies for test, Design for testability- BIST-chip level and system level test techniques.							
UNIT V	SPECIFICATION USING VERILOG HDL						9
Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Design hierarchies, Behavioral and RTL modeling, Test benches, Examples: decoder, equality detector, comparator, priority encoder, full adder, Ripple carry adder and D flip flop.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Neil H. E Weste, David Harris, Ayan Banerjee, "CMOS VLSI Design - A circuits and systems perspective", Pearson Education, 3rd Edition, 2009.						
T2	A.Pucknell, Kamran Eshraghian, "Basic VLSI Design", Third Edition, Prentice Hall of India, 2007.						
REFERENCES							
R1	Uyemura J.P: "Introduction to VLSI circuits and systems", Wiley 2002.						
R2	David A Hodges, Horace Jackson, ResveSaleth, "Analysis and Design of Digital Integrated Circuits", McGraw Hill Publishing Company Limited, Third Edition, 2003.						
R3	K. Lal Kishore, VSV. Prabhakar, "VLSI Design", I. K international Publishing House Private Ltd, 2009.						
R4	Wayne Wolf, "Modern VLSI Design: IP-Based Design", Pearson, 4th Edition, 2009.						
R5	R.Jacob Baker, Harry W.LI., David E.Boye, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India 2019.						
COURSE OUTCOMES							

At the end of the course students should be able to	
CO 1	Understand electrical properties of MOS and CMOS circuits.
CO 2	Familiarize combinational circuit design concepts.
CO 3	Visualize sequential circuit design concepts.
CO 4	Analyze Verilog code, compile, simulate and execute on any VLSI design platform.
CO 5	Elaborate arithmetic building blocks.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3											3		
C02	3	2	2								2	3	2	
C03	3	2	2								2	3	2	
C04	3	3	2									3		
C05	3										2	3	2	2

23ECP302	VLSI SYSTEM DESIGN LABORATORY	L	T	P	C
		0	0	4	2
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To afford in depth awareness on tools of FPGA and CMOS Gates. To familiarize Hardware Descriptive Language (Verilog) and design experience with EDA platforms. 					
LIST OF EXPERIMENTS					
<ol style="list-style-type: none"> Study of Synthesize and Simulation tools of FPGA. Study of physical design process or Back End Modeling. Design and Simulate a Schematic and Layout of CMOS Inverter. Design and Simulate a Schematic and Layout of CMOS NOR Gates. Design and Simulate a Schematic and Layout of CMOS NAND Gates. Design of Adders and subtractors Design of ripple carry adder Design of Encoders & Decoders Design of Flip-Flops Design of Sequence Detector on FPGA Board. 					
		L:0	T:0	P: 4	Total: 60 Periods
TEXT BOOKS					
T1	Neil H. E Weste, David Harris, Ayan Banerjee, "CMOS VLSI Design - A circuits and systems perspective", Pearson Education, 3rd Edition, 2009.				
T2	A.Pucknell, Kamran Eshraghian, "Basic VLSI Design", Third Edition, Prentice Hall of India, 2007.				
REFERENCES					
R1	Uyemura J.P: "Introduction to VLSI circuits and systems", Wiley 2002.				
R2	David A Hodges, Horace Jackson, ResveSaleth, "Analysis and Design of Digital Integrated Circuits", McGraw Hill Publishing Company Limited, Third Edition, 2003.				
R3	K. Lal Kishore, VSV. Prabhakar, "VLSI Design", I. K international Publishing House Private Ltd, 2009.				
R4	Wayne Wolf, "Modern VLSI Design: IP-Based Design", Pearson, 4th Edition, 2009.				
R5	R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India 2019.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Understand the concepts of designing tools in VLSI.				

CO 2	Understand the schematic and layout concepts.
CO 3	Introduction to Verilog HDL & Hierarchical Modeling Concepts.
CO 4	Design Verification using Test benches.
CO 5	Implement Digital Circuits on Xilinx FPGAs using Verilog HDL.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3										3		2
C02	3	3	2								2	3	2	2
C03	3	2	2								2	3	2	2
C04	3	2	2								2	3	2	
C05	3	2	2								2	3	2	

23ECB301	MICROCONTROLLER AND ITS APPLICATIONS	L	T	P	C
		3	0	2	4
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To understand the concepts of Microcontrollers and its Applications. To develop knowledge on Interfacing concepts with PIC Microcontroller, PIC Timer, Serial Port and Interrupts. 					
UNIT I	8051 MICROCONTROLLER	9+6			
THEORY					
Review of Microprocessors- 8085, 8086. Microcontrollers for an Embedded System – 8051– Architecture and internal units – Addressing Modes– Instruction Set – Program and Data Memory – Stacks – Interrupts – Timer/Counter.					
PRACTICAL					
<ol style="list-style-type: none"> Test and Study Hardware and Software development tool for 8051. Simulate using Keil uvision for 8051 -Data Transfer - Block move, Exchange, Sorting. 					
UNIT II	INSTRUCTION SET OF 8051	9+6			
THEORY					
Basic assembly language programming – Data transfer instructions – Data and Bit manipulation instructions – Arithmetic instructions – Logical operations – Internal RAM and SFRs - timer- PWM.					
PRACTICAL					
<ol style="list-style-type: none"> Develop Arithmetic Instructions using 8051 Trainer Kit. Develop an ALP/C program to generate a square wave in 8051 microcontroller. 					
UNIT III	INTERFACING WITH 8051 AND ASYNCHRONOUS SERIAL COMMUNICATION	9+6			
THEORY					
Interfacing and programming of: ADC & DAC - stepper motor - 4x4 keyboard matrix - LCD - Introduction to serial communication - RS232 standard - Max 232/233 Driver.					
PRACTICAL					
<ol style="list-style-type: none"> Develop an ALP/C program for waveform generation using DAC using Keil uvision. Develop an ALP/C program for waveform generation using ADC using Keil uvision. Simulate Serial Communication Program using RS 232. 					
UNIT IV	PIC MICROCONTROLLERS	9+6			
THEORY					
Evolution of PIC Microcontrollers and Embedded Processors- PIC16F877A PIN diagram- PIC Configuration-Registers: - The WREG Register in PIC-PIC File Register and access Bank - PIC Status Register- PIC Data Format and Directives- PIC Instructions.					
PRACTICAL					
<ol style="list-style-type: none"> Test Hardware and Software development tool for PIC. Develop and execute program on LCD Display using PIC Microcontroller. 					
UNIT V	PIC TIMER, SERIAL PORT AND INTERRUPTS	9+6			
THEORY					

Input and Output Ports and TRIS registers- Time Delay and Instruction Pipeline - Counters- Basics of Serial Communication- PIC connection to RS232- PIC Interrupts- Programming Timer - MSP430- Case study on Industrial Automation.			
PRACTICAL			
1.Develop and execute Keyboard interfacing with PIC16F877A.			
2. Develop an I/O Port program using Seven Segment Display.			
L:45		T:0	P: 30
Total: 75 Periods			
TEXT BOOKS			
T1	Microcontrollers Architecture, Programming, Interfacing and System Design – Raj Kamal,Pearson Education, 2011.		
T2	Verle Milan, “PIC Microcontrollers-Programming in C”, Mikroelektronika,1 st Edition, 2009.		
REFERENCES			
R1	T. R. Padmanabhan, “Introduction to microcontrollers and applications”, First Edition, Narosa publishing house private limited, 2007.		
R2	Kenneth. J. Ayala, “The 8051 Microcontroller”, Cengage Learning, 3rd Edition, 2004.		
R3	Peatman John B “Design with PIC Microcontrollers”, Pearson Education,2002.		
R4	Ajay V.Deshmukh , “Microcontroller Theory & Applications “, McGraw Hill Edu, 2016.		
R5	Ramesh Gaonkar, “Fundamentals of Microcontroller and Applications in Embedded Systems” , Penram ,2010.		
COURSE OUTCOMES			
At the end of the course students should be able to			
CO 1	Understand the concepts of microcontrollers and its Architecture.		
CO 2	Comprehend Addressing modes and instruction set of 8051.		
CO 3	Interface LCD, 4x4 Keyboard, matrix ADC& DAC, Sensors, and Stepper Motor with PIC18 microcontroller.		
CO 4	Understand the Architecture and Features of PIC Microcontroller.		
CO 5	Interpret the concepts of PIC Timer, Serial Port and Interrupts.		

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02	PS03
C01	3	3	2									3		
C02	3	3	3									3	2	
C03	3	3	3		3				3				3	3
C04	3	3	2									3		
C05	2	2		3	3				2				3	3

PROFESIONAL ELECTIVE - I

23ECE301	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To understand the fundamentals of digital image processing and transformations. To develop knowledge in image processing techniques for enhancement, restoration, compression, segmentation, and pattern classification. 					
UNIT I	DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS	9			
Fundamental steps in digital image processing, Components of an image processing system, Structure of human eye, A simple image formation model. Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models. Image transforms - Properties of 2D DFT, Discrete Cosine Transform, SVD transform, Wavelet transform.					
UNIT II	IMAGE ENHANCEMENT AND RESTORATION	9			
Image Enhancement: Histogram Processing- Histogram equalization, Matching, Local Histogram Processing, histogram statistics for image enhancement, smoothing linear filters, sharpening spatial filters, Image Restoration: A model of image degradation/ restoration process, Noise models–Inverse filtering – Wiener filtering – Constrained least mean square filtering – Geometric transformation.					
UNIT III	IMAGE COMPRESSION AND IMAGE SEGMENTATION	9			
Image Compression: Need for compression – Huffman Coding, Arithmetic Coding, Run length coding, Lossy compression - Transform coding, Wavelet coding. Image segmentation: Detection of isolated points, line detection, Edge models, Basic edge detection, Region based segmentation – region growing, Region splitting and merging – Case study on Tumor Detection.					
UNIT IV	MORPHOLOGICAL IMAGE PROCESSING	9			
Basic concept, Dilation and Erosion process for binary and gray image with applications, Opening & Closing for binary and gray image with applications, Hit-or-Miss Transformation, Basic Morphological Algorithms, Morphological reconstruction.					
UNIT V	IMAGE PATTERN CLASSIFICATION	9			
Background-Patterns and Pattern Classes-Pattern Classification by Prototype matching - Optimum (Bayes)Statistical Classifiers-Neural Networks and Deep learning - Deep convolutional neural networks.					
		L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS					
T1	Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson, Fouthth Edition, 2022.				
T2	Anil K. Jain, “Fundamentals of Digital Image Processing”, Pearson,First Edition 2015.				
REFERENCES					
R1	William K. Pratt, “Digital Image Processing”, John Wiley, New York,Fifth Edition, 2010.				
R2	Kenneth R. Castleman, “Digital Image Processing”, Pearson, First Edition ,2007.				

R3	John,R.Jensen, Introduction to Digital Image Processing, Prentice Hall, NewJersey, 2021 Fourth edition.
R4	Chris Solomon,Toby Breckon"Fundamentals of Digital Image Processing",John Wiley & Sons,2010.
R5	Digital Image Processing Using MATLAB – Rafael C. Gonzalez, Richard E. Woods & Steven L. Eddins, Pearson,2011.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Understand the fundamentals of digital image processing.
CO 2	Apply different techniques adapted for image enhancement and restoration techniques in spatial and frequency domain.
CO 3	Implement Image Compression and Segmentation Methods.
CO 4	Familiarize the functions of Morphological Image Processing.
CO 5	Develop Image Classification Systems.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PSO1	PSO2	PSO3
C01	3											3	3	
C02	3	3		2	3			2						
C03	3	3	3		3			2			3			
C04	3	3			3			2						
C05	3	3	3	2	3	3		2			3			3

23ECE302	FLEXIBLE ELECTRONICS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To provide an overview of flexible electronics technology. To understand the materials and methods used for fabrication of flexible electronics. 							
UNIT I	INTRODUCTION TO FLEXIBLE ELECTRONICS AND THIN FILM PROCESSING METHODS						9
Introduction: Background and history, trends, emerging technologies, general applications, areas of research. Thin Film Processing Methods: CVD, PECVD, PVD, etching, photolithography, low-temperature process integration.							
UNIT II	MATERIALS FOR FLEXIBLE ELECTRONICS						9
Nanowire and nanoparticle synthesis, transition metal oxides, amorphous thin films, polymeric semiconductors, structure and property relationships, paper-based electronics, textile substrates, barrier materials.							
UNIT III	THIN FILM TRANSISTORS: DEVICE STRUCTURE AND PERFORMANCE						9
Fundamental issues for low-temperature processing, Low-temperature thin-film transistor Devices, Device structures and materials processing, Low-temperature a-Si:Hand a-IGZO thin-film transistor device performance, I-V characteristics, device stability.							
UNIT IV	SOLUTION BASED PATTERN PROCESSES						9
Ink-jet printing, gravure, imprint lithography, spray pyrolysis, surface energy effects, multilayer patterning, design rule considerations.							
UNIT V	FLEXIBLE ELECTRONICS APPLICATIONS						9
Displays, sensor arrays, memory devices, MEMS, lab-on-a-chip, and flexible solar panels, Contemporary issues.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	William S. Wong, Alberto Salleo, Flexible Electronics: Materials and Applications, 2011, 1 st Edition, Springer, New York.						
T2	Guozhen Shen, Zhiyong Fan, "Flexible Electronics: From Materials to Devices", 2015, 1 st Edition, World Scientific Publishing Co, Singapore.						
REFERENCES							
R1	Edward Sazonov, Michael R. Newman, "Wearable Sensors: Fundamentals, Implementation and Applications", 2014, 1 st Edition, Academic Press, Cambridge.						
R2	Kate Hartman, "Make: Wearable Electronics: Design, prototype, and wear your own interactive garments", 2014, 1 st Edition, Marker Media, Netherlands.						
R3	Yugang Sun, John A. Rogers, "Semiconductor Nanomaterials for Flexible Technologies: From Photovoltaics and Electronics to Sensors and Energy Storage (Micro and Nano Technologies)", 2011, 1 st Edition, William Andrew, New York.						
R4	Guozhen Shen, Zhiyong Fan, "Flexible Electronics: From Materials To Devices" World Scientific,2016.						
R5	Seung Hwan Ko , Daeho Lee , Zhigang Wu, "Flexible and Stretchable Electronics"						

	Micromachines,2017.
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COURSE OUTCOMES	
At the end of the course students should be able to	
C01	Understand the trends and technologies of flexible electronics and its road map.
C02	Identify the materials for flexible electronics application.
C03	Apply the various thin film deposition methods.
C04	Provide the insight of TFT device structures and its characteristics.
C05	Fabricate the foil type flexible electronics using solution-based patterning methods.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PSO1	PSO2	PSO3
C01	3	2	3		3							3	2	
C02	3	3										2		
C03	2	2	2		2	2		2					2	2
C04	2										2	2		
C05		2	2					2			2		2	2

23ECE303	ADVANCED DIGITAL SIGNAL PROCESSING	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To know about multirate signal processing and discrete time random signal process. To understand the concept of prediction theory, filtering and spectrum estimation techniques. 					
UNIT I	MULTIRATE SIGNAL PROCESSING	9			
Review of Convolution, DFT and Z-Transform, Multirate Signal Processing - Decimation, Interpolation, Sampling Rate Conversion by a rational factor – digital filter banks, sub band coding, Quadrature Mirror Filter.					
UNIT II	DISCRETE TIME RANDOM PROCESSES	9			
Stationary random processes, Autocorrelation, Rational Power Spectra, Filters for generating random Processes from white noise and inverse filter – AR, MA and ARMA processes – relationship between autocorrelation and the filter parameters.					
UNIT III	LINEAR PREDICTION AND FILTERING	9			
Linear Prediction – Forward and Backward - Wiener filters for filtering and prediction – FIR Wiener Filter – IIR Wiener Filter – Kalman Filter.					
UNIT IV	ADAPTIVE FILTERING	9			
FIR adaptive filters – adaptive filters based on steepest descent method – LMS algorithm – Variants of LMS algorithm – adaptive echo cancellation – adaptive channel equalization – RLS Algorithm.					
UNIT V	SPECTRUM ESTIMATION	9			
Estimation of power spectra from finite duration observations of signals – Non parametric methods of spectrum estimation – the Bartlett and the Welch method – Parametric spectrum estimation – AR, MA and ARMA.					
		L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS					
T1	John G. Proakis & Dimitris G.Manolakis, –Digital Signal Processing – Principles, Algorithms & Applications, PHI, 3 rd Edition, 2014.				
T2	P. Vaidyanathan, "Multirate systems and filter banks", Prentice Hall Inc. 1993.				
REFERENCES					
R1	Monson H. Hayes, "Statistical digital signal processing and modeling", John Wiley and Sons Inc. New York, Indian reprint 2008.				
R2	Haykin, Adaptive Filter Theory, 4th Edition, Pearson Education, New Delhi, 2006.				
R3	Bernard Widrow, Samuel D Stearns, "Adaptive Signal Processing", 1st Edition, Pearson India, 2002.				
R4	Sanjit K. Mitra - Digital Signal Processing: A Computer Based Approach, 2nd Edition, Tata McGraw-Hill, 2001.				
R5	Dimitris G. Manolakis, Vinay K. Ingle, Stephen M. Kogon, –Statistical and Adaptive Signal Processing. Artech House, 2005.				
COURSE OUTCOMES					
At the end of the course students should be able to					

C01	Comprehend multirate signal processing and demonstrate its applications.
C02	Demonstrate an understanding of the power spectral density and apply to discrete random signals and systems.
C03	Apply linear prediction and filtering techniques to discrete random signals for signal detection and estimation.
C04	Analyze adaptive filtering problems and demonstrate its application.
C05	Apply power spectrum estimation techniques to random signals.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3	3		2							3	3	
C02	3	2		2		2							2	2
C03			3	2		2							2	1
C04		3	2		2	1						3		
C05	3			2	1							2	3	1

23ECE304	SMART SENSORS AND DEVICES	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To understand various physical phenomena behind the operation of different types of sensors and microsystems. To design sensors with appropriate electronic interface as a complete system. 					
UNIT I	OVERVIEW OF MEASUREMENTS AND SENSORS	9			
Sensors Functions- Classifications and Terminology of sensors-Classification of errors- Error analysis- Measurement of displacement using Potentiometer-Measurement of temperature using Thermistor -Measurement of position using Hall effect sensors-Physical Principles of Sensing.					
UNIT II	VARIABLE RESISTANCE AND INDUTANCE SENSORS	9			
Characteristics of Resistive potentiometer -Resistive thermometers -Thermistors - Pyroelectric Effect- Piezoresistive sensors- Variable reluctance transducers- Hall effect - Seebeck and Peltier effects.					
UNIT III	VARIABLE AND OTHER SPECIAL SENSORS	9			
Variable air gap type-variable area type- variable permittivity type- Magnetic Sensor -Acoustic Sensors- FET devices for gas and ion sensing-Proximity sensors: Inductive & Capacitive-Use of proximity sensor as accelerometer and vibration sensor.					
UNIT IV	EMERGING TRENDS IN SENSORS AND MEMS	9			
Quantum Sensors-Wearable Sensors -Ultrasonic Sensor- Laser Sensors - AI-Powered Sensor Networks- Terahertz Sensors-MEMS Fabrication Technologies - MEMS Actuators - Smart MEMS Sensors with AI.					
UNIT V	APPLICATIONS OF SMART SENSORS AND DEVICES	9			
Advanced driver assistance systems (ADAS) - LiDAR (Light Detection and Ranging) Semiconductor Sensor - Automatic robot control - Case study: AI and Edge Computing, Hypersonic Vehicle Sensor Technologies, Nano-Sensors for Biomedical Applications, Block chain for Smart Sensor Data Security.					
		L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS					
T1	Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs, and Applications", Springer; 4th ed. 2010.S. M. Sze, "Semiconductor Sensors", Wiley-Interscience, 2023.				
T2	Doebelin's Measurement Systems: 7th Edition (SIE),Ernest O. Doebelin DhaneshN.Manik McGraw Hill Publishers, 2019.				
REFERENCES					
R1	Gerard Meijer, "Smart sensor systems", Wiley, 2008. W Gopel, J. Hesse, J. N. Zemel, "Sensors A Comprehensive Survey", Vol. 9, Wiley-VC 2023.				
R2	Patranabis.D, "Sensors and Transducers", 2nd Edition, Prentice Hall India Ltd,2023.				
R3	Smart Sensors and MEMS: Intelligent Sensing Devices and Microsystems for Industrial Applications S. Nihtianov, A. Luque Woodhead Publishing 2018.				
R4	Handbook of Modern Sensors: Physics, Designs, and Applications, Jacob Fraden 2015 (Fifth Edition) Springer.				
R5	Smart Sensors Networks: Communication Technologies and Intelligent Applications				

Edited by Fatos Xhafa, Leonard Barolli, and Petre Dini, this 2017.

COURSE OUTCOMES

At the end of the course students should be able to

CO 1	Understand various physical phenomena behind the operation of sensors and micro systems.
CO 2	Design sensors with appropriate electronic interface as a complete system.
CO 3	Compare different types of special sensors in terms of their suitability for specific applications.
CO 4	Generate new ideas in designing the sensors and MEMS for automotive application.
CO 5	Analyze and select suitable sensors for Future Applications.

Mapping of Programme Outcomes / Programme Specific Outcomes

(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)

COs	CO-PO Mapping											CO-PSO Mapping		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
	CO1	3	3	3									3	
CO2	3	3	3									2		
CO3	2	2	2									3	3	2
CO4	3	3	3								3	3	3	3
CO5	2	2	3								3	2	3	3

23ECE305	MULTIMEDIA COMPRESSION TECHNIQUES				L	T	P	C
		3	0	0	3			
COURSE OBJECTIVES:								
<ul style="list-style-type: none"> To make students to discover various types of compression techniques. To carry out the transform coding and incorporate it in various applications. 								
UNIT I	INTRODUCTION							9
Multimedia data – Features – Storage requirements for multimedia – Need for Compression – Taxonomy of compression – Quantitative and Qualitative techniques – Overview of source coding – Source coding theorem – Channel coding theorem.								
UNIT II	TEXT AND IMAGE COMPRESSION							9
Text compression – Characteristics of text data – Huffman coding – Adaptive Huffman coding – Arithmetic coding – Run Length Coding – Lempel Ziv Welsh Compression, Image compression – JPEG Standard, JPEG 2000 Standard, SPIHT.								
UNIT III	AUDIO AND VIDEO COMPRESSION							9
Audio compression – Fundamental concepts of speech and audio – DPCM – Adaptive DPCM – predictive coding – Code excited LPC – Delta Modulation, Video compression – Fundamental concepts of video – Video signal representation – MPEG 1, 2 and 4 – H.264 standard.								
UNIT IV	TRANSFORM CODING AND STANDARDS							9
Transform coding introduction – Discrete cosine transform – Discrete Walsh Hadamard transform – Fundamentals of Wavelets – Properties – DWT - Audio coding – MPEG audio coding.								
UNIT V	MULTIMEDIA NETWORKING AND APPLICATIONS							9
Multimedia networking – Applications – A Design Thinking approach of making the best Effort service – Protocols for real time interactive applications – Distributing multimedia – Scheduling and policing mechanisms – Integrated services – Differentiated Services – RSVP.								
					L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS								
T1	Khalid Sayood: Introduction to Data Compression, Morgan Kauffman Harcourt India, Fifth Edition, 2017.							
T2	David Salomon, “Data Compression – The Complete Reference”, Springer Verlag New York Inc., 4 th Edition, 2007.							
REFERENCES								
R1	Z. N. Li, M. S. Drew and J. Liu, Fundamentals of Multimedia, Springer , Third Edition 2021.							
R2	D. Salomon and Giovanni Motta “Handbook of Data Compression”, Fifth Edition, Springer-Verlag London Limited 2010.							
R3	Yun Q. Shi, Huifang Sun, “Image and Video Compression for Multimedia Engineering - Fundamentals, Algorithms and Standards”, CRC press, Third Edition, 2019.							
R4	Peter Symes , “Digital Video Compression”, McGraw Hill Pub., 2004.							
R5	M. Rabbani: “Digital image compression techniques”, First Edition, SPIE Press Book, 1991.							
COURSE OUTCOMES								
At the end of the course students should be able to								

CO 1	Express the principles of compression lucidly.
CO 2	Analyze the different types of text and image compression.
CO 3	Apply the various techniques towards audio and video compression.
CO 4	Examine transform coding for data compression and applications.
CO 5	Interpret the principles of multimedia networking.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes (1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3											3		
C02	3	2	2								2	3	2	
C03	3	2	2								2	3	2	
C04	3	3	2									3		
C05	3										2	3	2	2

23ECE306	COMPUTER VISION			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To understand the fundamental concepts related to Image formation and processing. To become familiar with feature-based alignment and motion estimation. 							
UNIT I	INTRODUCTION TO IMAGE FORMATION AND PROCESSING						9
Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.							
UNIT II	FEATURE DETECTION, MATCHING AND SEGMENTATION						9
Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.							
UNIT III	FEATURE-BASED ALIGNMENT & MOTION ESTIMATION						9
2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion.							
UNIT IV	3D RECONSTRUCTION						9
Shape from X - Active range finding - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos.							
UNIT V	IMAGE-BASED RENDERING AND RECOGNITION						9
View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer- Texts in Computer Science, Second Edition, 2022.						
T2	Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015.						
REFERENCES							
R1	Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.						
R2	Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006.						
R3	E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012.						
R4	Dr. Reinhard Klette, "Concise Computer Vision - An Introduction into Theory and Algorithms", Springer, January 2014.						
R5	Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 1st edition, June 2012.						

COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Understand basic knowledge, theories and methods in image processing and computer vision.
CO 2	Implement basic and some advanced image processing techniques in OpenCV.
CO 3	Apply 2D a feature-based based image alignment, segmentation and motion estimations.
CO 4	Apply 3D image reconstruction techniques.
CO 5	Design and develop innovative image processing and computer vision applications.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
C01	3	3	2									3	2	
C02	3				2							3	1	1
C03	3			2								3	3	2
C04	3	3										3		
C05	3	3										3	1	3

OPEN ELECTIVE COURSES

23ECO301	ADVANCED MOBILE COMMUNICATION	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> • To introduce recent advancements and growing trends in mobile telecommunications. • To analyze security techniques and Applications of Advanced Mobile communication system. 					
UNIT I	MOBILE COMMUNICATIONS OVERVIEW	9			
Evolution of mobile systems, Analog voice systems in 1G, Digital radio systems in 2G: Voice and messaging services, TDMA based GSM, CDMA, 3G UMTS- Introduction to 4G: IMT Advanced, LTE, VoLTE.					
UNIT II	INTRODUCTION TO 5G	9			
Overview - What Is 5G? - Background, Research and Challenges for Electronics -Expected 5G in Practice - 5G and Security - Motivations for 5G - 5G Standardization and Regulation - Global Standardization in 5G Era. 5G Requirements Based on ITU.					
UNIT III	DATA RATES IN MOBILE COMMUNICATION	9			
Fundamental Constraints in achieving High Data Rates, Wider bandwidth and Spectrum Composition, Low frequency spectrum: Characteristics and challenges, capacity and coverage Trade-offs, spectrum for 5G NR, unlicensed mm waves bands, Terahertz spectrum, spectrum requirements for 6G.					
UNIT IV	RADIO NETWORK	9			
Radio access technology-Orthogonal Frequency Division Multiplexing- Channel estimation and equalization- Multiple-Input Multiple-Output Techniques-Advanced MIMO-Radio network architecture and Interfaces. Case Study: The Role of 5G and beyond in the Cyber-World.					
UNIT V	SECURITY SERVICES AND APPLICATIONS	9			
Security Threats and Challenges- Security Implications in 5G Environments and Use Cases - Security Layers- Device Security- Security between Network Entities, Applications: Vehicle Communications, Machine Learning and Artificial Intelligence in 5G.					
		L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS					
T1	5G explained: security and deployment of advanced mobile communications by Jyrki T.J. Penttinen. Hoboken, NJ, USA: John Wiley & Sons, Inc., 2019.				
T2	Theodore S. Rappaport, "Wireless communications", Second Edition, Pearson Education, 2010.				
REFERENCES					
R1	Rappaport.T. S, "Wireless Communications: Principles and Practice", Second Edition, Pearson Education, Reprint.				
R2	6G wireless communications and mobile networking by xianzhong Xie, Bo Rong, Michel Kadoch-Bentham books.				
COURSE OUTCOMES					
At the end of the course students should be able to					
CO 1	Understand the evolution of mobile communication standards developed over the years.				

CO 2	Examine the development, challenges and requirements of mobile communications.
CO 3	Interpret the methods to improve the data rate of modern mobile communication systems.
CO 4	Develop the ability to understand and apply advanced radio access technologies to optimize performance in 5G and beyond.
CO 5	Summarize the security, services and applications of Next generation communication techniques.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3											3	2	
C02	3	2										3	2	
C03	3	2										3	3	
C04	3			2								3		
C05	2		2			2	2					3		

23ECO302	EMBEDDED SYSTEM DESIGN USING ARDUINO			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To understand the architecture, components, and functioning of embedded systems, along with the strategic selection of processors, memory, and I/O devices. To gain hands-on experience in designing and implementing embedded systems using Arduino, focusing on interfacing sensors, actuators, and real-time applications. 							
UNIT I	INTRODUCTION TO EMBEDDED SYSTEMS						9
Structural units in a processor, processor selection for an embedded system, System design using general purpose processor: Microcontroller architectures (RISC, CISC), Embedded Memory, Strategic selection of processor and memory.							
UNIT II	DEVICES AND EMERGING BUS STANDARDS						9
I/O Devices: - Types and Examples of I/O devices, Communications from Serial Devices - Internal Serial Emerging bus standards and communication: USB, PCI, UART, SPI, I2C, CAN, Bluetooth, Zigbee.							
UNIT III	ARDUINO PLATFORM OVERVIEW						9
Arduino: history and development. Arduino hardware architecture and specifications. Arduino development environment: IDE and tools. Programming Arduino using C++ and Arduino language.							
UNIT IV	INTERFACING WITH ARDUINO						9
Digital and analog I/O operations. Interfacing sensors (e.g., temperature, light, motion) with Arduino, Interfacing actuators (e.g., motors, LEDs, displays) with Arduino.							
UNIT V	REAL-TIME OPERATING SYSTEMS (RTOS) IN EMBEDDED SYSTEMS						9
Real-time systems and RTOS concepts. Task scheduling and management in RTOS. Implementing simple RTOS on Arduino. Case studies of RTOS-based applications.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Raj Kamal, "Embedded Systems- Architecture, Programming and Design", McGraw Hill Education; Third edition 2017.						
T2	Rajesh Singh, Anita Gehlot, Bhupendra Singh, and Sushabhan Choudhury, "Programming and Interfacing with Arduino", CRC Press, 1st edition 2020.						
REFERENCES							
R1	Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design – Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001.						
R2	Qing Li , Caroline Yao , "Real –Time Concepts for Embedded Systems", CRC Press 2003.						
R3	Tianhong Pan and Yi Zhu, Designing Embedded Systems with Arduino: A Fundamental Technology for Makers 1st edition 2019.						
R4	Bashir I. Morshed, "Embedded Systems – A Hardware-Software Co-Design Approach: Unleash the Power of Arduino!", 1st edition 2021.						
R5	Elecia White, "Making Embedded Systems: Design Patterns for Great Software", 3rd edition 2011.						
COURSE OUTCOMES							
At the end of the course students should be able to							

CO 1	Explain the structural units of embedded systems, including processor architectures, memory, and their strategic selection for system design.
CO 2	Describe and apply various communication protocols and bus standards, including USB, SPI, I2C, and Bluetooth, in embedded system applications.
CO 3	Demonstrate proficiency in Arduino programming, hardware architecture, and the development environment for embedded system projects.
CO 4	Interface sensors and actuators with Arduino boards and develop applications for real-world embedded systems.
CO 5	Apply RTOS concepts to implement real-time applications on Arduino platforms, including task scheduling and case studies of RTOS-based systems.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PSO1	PSO2	PSO3
C01	3											3	2	
C02	2											3	1	1
C03	2	1	2	2	1							3	3	2
C04	2	2			1							3		
C05	3	2			3							3	2	3

23EC0303	BASICS OF SENSOR TECHNOLOGY			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To gain knowledge about the principles and analysis of sensors. To make students to learn the applications of sensors. 							
UNIT I	FUNDAMENTALS OF SENSORS						9
Sensor, transducer and Actuators- Classification of sensors: Proprioceptive and Exteroceptive – Active and Passive– Contact and Non-contact, selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, Primary sensing elements.							
UNIT II	TEMPERATURE AND PRESSURE SENSORS						9
Temperature sensors: Principle of operation, construction details, characteristics and applications of Bimetallic thermometer, Resistance thermometer, Thermistor, Thermocouples and Total radiation Pyrometers, Pressure sensors: Piezoresistive and capacitive pressure sensor, Manometer, vacuum sensors.							
UNIT III	DISPLACEMENT, LEVEL AND FLOW SENSORS						9
Displacement Sensors: LVDT, RVDT, eddy current, transverse inductive, Hall Effect, magneto resistive, magnetostrictive sensors, Liquid level sensor: Fabry Perot sensor, ultrasonic sensor, capacitive liquid level sensor, Flow sensors: pressure gradient technique, ultrasonic, electromagnetic sensors and Hot wire anemometer. Micro flow sensor, Coriolis mass flow and drag flow sensor.							
UNIT IV	MICRO SENSORS						9
Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors.							
UNIT V	MEDICAL SENSORS						9
Bio signal characteristics – frequency and amplitude ranges, ECG – EEG – EMG – ERG – lead system and recording methods – typical waveforms. Electromagnetic sensor, X ray imaging with sensors, Blood gas and pH sensor, Electrochemical sensor, Optical fiber sensor, Magnetic field sensors for imaging.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Jacob Fraden, “Handbook of Modern Sensors: Physics, Designs, and Applications”, Springer; 4th ed. 2010.S. M. Sze, “Semiconductor Sensors”, Wiley-Interscience, 2023.						
T2	Doebelin's Measurement Systems: 7th Edition (SIE),Ernest O. Doebelin DhaneshN.Manik McGraw Hill Publishers, 2019.						
REFERENCES							
R1	Gerard Meijer, “Smart sensor systems”, Wiley, 2008. W Gopel, J. Hesse, J. N. Zemel, “Sensors A Comprehensive Survey”, Vol. 9, Wiley-VC 2023.						
R2	Patranabis.D, “Sensors and Transducers”, 2nd Edition, Prentice Hall India Ltd,2023.						
R3	Smart Sensors and MEMS: Intelligent Sensing Devices and Microsystems for Industrial Applications S. Nihtianov, A. Luque Woodhead Publishing 2018.						

R4	Handbook of Modern Sensors: Physics, Designs, and Applications, Jacob Fraden 2015 (Fifth Edition) Springer.
R5	Smart Sensors Networks: Communication Technologies and Intelligent Applications Edited by Fatos Xhafa, Leonard Barolli, and Petre Dini, this 2017.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Understanding the basic fundamentals of the resistive sensors.
CO 2	Identify the materials and designing the Sensors.
CO 3	Analyze various types of sensors.
CO 4	Design Micro sensors for various applications.
CO 5	Apply basic knowledge in life assisting devices and fundamentals of devices.

Cos	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	2			2							3	2	
C02	3	2	2		2							2		
C03	2							2					2	1
C04	3	2	3								2	2		
C05			2								2		2	1

23ECO304	MEASURING INSTRUMENTS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To make students to learn various measuring devices and calibrations. To gain knowledge of measuring instruments and their applications. 							
UNIT I	ANALOG MEASUREMENT						9
Introduction to measurement of speed, frequency and power factor, Electrical Quantities – Electro dynamic, Electrostatic & Rectifier type Ammeters & Voltmeters, Wattmeter, errors & remedies in wattmeter and energy meter.							
UNIT II	DIGITAL MEASUREMENT						9
Digital Measurement of Electrical Quantities-Concept of digital measurement, block diagram of digital voltmeter, frequency meter Power Analyzer and Harmonics Analyzer; Electronic Multimeter.							
UNIT III	TRANSDUCERS						9
Strain Gauges, Thermistors, Thermocouples, Linear Variable Differential Transformer (LVDT), Capacitive Transducers, Peizo-Electric transducers, Optical Transducer, Torque meters, inductive torque transducers, electric tachometers, photo-electric tachometers, Hall Effect Transducer.							
UNIT IV	COMPARATIVE MEASUREMENTS AND DISPLAYS						9
D.C potentiometers, D.C Wheat stone, Kelvin and Kelvin Double bridge & A.C bridges Maxwell, Anderson and Schering bridges, transformer ratio bridges, self-balancing bridges, Display methods and devices, magnetic recorders – digital recorders, digital storage oscilloscope, digital plotters and printers, CRT display, digital CRO, LED, LCD & Dot matrix display – Data Loggers.							
UNIT V	APPLICATIONS						9
Applications of Instrumentation amplifiers – differential amplifiers – Data transmission and telemetry – methods of data transmission, General telemetry systems – Elements of data acquisition system – Smart sensors.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Golding E.W Electrical Measurements & Measuring Instruments, 6 th ed. Reem Publications,2019.						
T2	Sawhney A. K., Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai &Co.,2015						
REFERENCES							
R1	Thereja .B.L, “Fundamentals of Electrical Engineering and Electronics”, S Chand & Co Ltd, 2010						
R2	W.D.Cooper & A.D.Helfrick, “Modern Electronic Instrumentation and Measurement Techniques”, 5th Edition, PHI, 2012.						
R3	Oliver & Cage, Electronic Measurements & Instrumentation, McGraw Hill, 2017						
R4	H.K.P. Neubert, Instrument transducers, Oxford University press.2016						
R5	A.D. Heltric & W.C. Copper, Modern Electronic instrumentation & Measuring instruments, Wheeler Publication.2015						
COURSE OUTCOMES							

At the end of the course students should be able to	
CO 1	Realize the analog and digital measurement techniques and basics of error.
CO 2	Estimate the relevance of analog and digital measurements in efficient manner
CO 3	Understand the basic operation of different transducers and its functionality.
CO 4	Demonstrate various comparative measurements and display applications.
CO 5	Comprehend the various applications of amplifiers.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3		1									3		1
C02	3	3	2	1									2	2
C03	3	2	1	2	2								2	
C04	2	2			1							3	2	
C05	2		2	3	2							2		3

23ECO301	CONSUMER ELECTRONICS			L	T	P	C
				3	0	0	3
COURSE OBJECTIVES:							
<ul style="list-style-type: none"> To acquaint the students with the fundamental concepts, construction and working of Audio systems and sound recorders. To gain knowledge on current communication technology and working operations of different types of video systems, domestic and consumer appliances. 							
UNIT I	AUDIO SYSTEM						9
Microphone - Characteristics of Microphones - Gun Microphones - Wireless Microphones - Headphones and Headsets - Basic Loudspeaker - Loudspeaker Construction - Woofers - Multispeaker systems – Baffles- Intelligent Building Perspective.							
UNIT II	COMMUNICATION SYSTEMS						9
Cordless Telephones - Fax Machines - Personal Digital Assistant - Tablets - Smart Phones - Smart Watches - Video security - Internet Enabled Systems - GPS and Tracking Systems.							
UNIT III	ELECTRONIC MUSIC SYNTHESIZERS						9
Typical Generator - Basic Modifiers - Voltage Control - Envelope Generator - Electric Guitar – Digital Computer - Theater Sound System: Sound track, Types of sound film, Theater Sound Reproduction system, Working of a Projector- Home Virtual Assistants- Alexa and Google Home.							
UNIT IV	VIDEO SYSTEMS AND DISPLAYS						9
Monochrome - Color TV standards - TFT, Plasma, HDTV, LCD, LED TV- Photocopier - Video Telephone and Video Conferencing.							
UNIT V	DOMESTIC AND CONSUMER APPLIANCES						9
Adhoc systems in Car - Washing machines - Microwave ovens - Air conditioners and Refrigerators -Airline Reservations - Remote controls - Automated Teller Machines - Set top Boxes - Bar codes – RFID - Automatic Cleaning Robots - Biometric attendance monitoring System.							
				L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS							
T1	Bali S P, Consumer Electronics, Pearson Education,2012, Latest edition.						
T2	Bali R and Bali S.P, Audio video systems: principle practices & troubleshooting, Khanna Book Publishing Co. (P) Ltd., 2010 Delhi, India, latest edition.						
REFERENCES							
R1	Nick vandome, Smart homes in easy steps, Master smart technology for your home 2018.						
R2	Dennis C Brewer, " Home Automation", Que Publishing 2013.						
R3	Sridhar Canumalla, Puligandla Viswanadham P.S.Bimbra, Portable Consumer Electronics: Packaging, Materials, and Reliability, Pennwalt Books, 1st Edition, 2010.						
R4	Thomas M. Coughlin, "Digital Storage in Consumer Electronics", Elsevier and Newness 2012.						
R5	Jordan Frith, Smartphones as Locative Media, John Wiley, 2014.						
COURSE OUTCOMES							
At the end of the course students should be able to							
CO 1	Develop the fundamental concepts, construction and working of Audio systems.						

CO 2	Apply and analyse different types of Audio systems.
CO 3	Implement the differentiate between types of electronic music synthesizers.
CO 4	Demonstrate the fundamental concepts, construction and working of video systems.
CO 5	Comprehend the working operations of different types of domestic and consumer appliances.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	3	2	2	2							3	3	
C02	2	2	3	2	2			2			2	3	2	
C03	2	2	3	2	2	1					3	2	2	3
C04	3	2	2	2	2			1			2	2	3	2
C05	2	3	2	3	2		1				3	2	3	2

23EC0306	MICROCONTROLLER FOR INDUSTRIAL APPLICATIONS	L	T	P	C
		3	0	0	3
COURSE OBJECTIVES:					
<ul style="list-style-type: none"> To make students to learn and understand the architecture of microcontrollers and their industrial applications. To gain knowledge of microcontroller programming and associated peripheral interface devices. 					
UNIT I	INTRODUCTION	9			
89c51 Microcontroller hardware block diagram - Data and program memory mapping – Register organization - Basic concepts of I/O pins - RISC and CISC machines.					
UNIT II	PIC MICROCONTROLLER	9			
Introduction to PIC micro controllers-PIC architecture-Advantage of PIC micro controllers –Types and products of PIC-Interfacing, Case study: Industrial Automation and Control.					
UNIT III	ARM ARCHITECTURE	9			
Architecture, Memory organization, The ARM Programmer’s model, Registers, Pipeline, Interrupts, I/O Memory, EEPROM, I/O Ports, SRAM, Timer, UART, Interrupt Structure, Serial Communication with PC.					
UNIT IV	ARDUINO & AT MEGA MICROCONTROLLER	9			
Overview of hardware, Install Arduino IDE, Arduino IDE and sketch overview, Understanding Arduino Syntax, Programming Arduino- Introduction to 8-bit AT mega microcontroller – Program for Smart Light System with LDR.					
UNIT V	MSP430 MICROCONTROLLER	9			
MSP430 Architecture, Memory, Central Processing Unit, Memory Mapped Input and Output, Clock Generator, Exceptions: Interrupts and Resets, Addressing Modes, Instruction set.					
		L:45	T:0	P: 0	Total: 45 Periods
TEXT BOOKS					
T1	Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey, “PIC Microcontroller and Embedded Systems using Assembly and C for PIC18”, Pearson Education, 2021.				
T2	Krishna Kant, “Microprocessor and Microcontrollers”, Eastern Company Edition, Prentice Hall of India, New Delhi, 2013.				
REFERENCES					
R1	Steve Furber, “ARM System-on-Chip Architecture”, Pearson Education, 2nd Edition, 2007.				
R2	Rajesh Singh, Anita Gehlot, Bhupendra Singh, and Sushabhan Choudhury, “Programming and Interfacing with Arduino”, CRC Press, 1 st edition 2020.				
R3	John H Davies, MSP430 Microcontroller Basics, Newnes Publications, Elsevier, 2008.				
R4	Myke Predko, “Programming and Customizing The PIC Microcontroller” McGrawHill, 1 st edition, 2017.				
R5	Jeremy Blum, “Exploring Arduino: Tools and Techniques for Engineering Wizardry” John Wiley & Sons, 2013.				
COURSE OUTCOMES					
At the end of the course students should be able to					

CO 1	Identify and understand the function of 89c51 Microcontroller.
CO 2	Analyze the architecture of PIC microcontroller and its interfacing.
CO 3	Apply the concept and algorithm for data handling and processing based on ARM instruction set.
CO 4	Learn programming with the Arduino & AT mega microcontroller.
CO 5	Compile programs for MSP430 Microcontroller.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
C01	3	2										3	2	
C02	3	2		3	2							3	2	
C03	3	2		3	2							3	3	
C04	3	2		3	2							3	3	
C05	3	2		3	2							3	3	